

Oh, Give Me a Home!



Creative Learning Activities Water Quality/Nonpoint Source Pollution

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THE PROBLEM

INTRODUCING NONPOINT SOURCE WATER POLLUTION

In the last several years there has been a dramatic shift in the way people have thought about the environment that we live in. Environmental disasters like oil spills, nuclear power plant accidents, chemical plant fires and major fish kills have caused us to take notice at the way we humans are threatening our environment.

Many agencies and organizations are working to educate people of the world in the fields of environmental protection and natural resource conservation. Research and legislative action during the last few years have resulted in a world-wide awareness of the need to educate and help preserve the quality of the environment. America's growth depends on our ability to find effective solutions to environmental problems.

One such problem that continues to plague our nation is water pollution. Many of the pollution problems that once affected our nation's waterways, such as sewage and industrial wastes, are now being resolved. Many fish have returned to waters that were once depleted of oxygen. Recreation in lakes, rivers and oceans that were once closed for health reasons, are now reopened. Even though agencies, like the United States Environmental Protection Agency with the Clean Water Act, have been effective in stopping many sources of pollution, the success is only partial. Water pollution still remains a problem in many areas.

Since many problems involving point source pollution (usually a discharge from a pipe) were solved through legislation, nonpoint source pollution problems are now the focus of water quality concerns. EPA estimates that over one-half of all water pollution originates from nonpoint sources. Nonpoint source water pollution comes from diffuse sources and is usually associated with rainfall runoff moving over and through the ground carrying natural and man-made pollutants into lakes, rivers, streams, wetlands, estuaries, coastal waters, and underground drinking water. In many cases it is difficult to identify all of the land use activities that comprise the nonpoint source pollution problem.

Unlike pollutants from point sources, which enter the environment from well-defined locations like sewage discharges and industrial wastes, nonpoint source pollutants usually find their way into surface and groundwater in quick surges and are often associated with rainfall and thunderstorms. Some of the land use activities that cause nonpoint source pollution include:

1. **Agriculture** - Between 50 to 70 percent of impaired or threatened surface waters (according to EPA) are affected by NPS pollution from agricultural activities. Sediment from soil erosion, farm chemicals, fertilizers and animal wastes that enter our waters are considered pollutants.

- **sediment** - defined as "dirt" that is carried along by water as it runs off the land. Most sediment comes from earth that has no or minimal vegetation on it. When raindrops hit the bare dirt, they cause the soil to move with the water and most of it, if unchecked, is carried in the runoff to the nearest drainage system and into streams, rivers, lakes and coastal waters.

• **pesticides, herbicides** and other farm, home and lawn chemicals can cause damage or death to aquatic organisms and can bioaccumulate in aquatic and terrestrial organisms when being transferred up the biological food chain.

• **fertilizers and animal wastes** add nutrients (mostly nitrates) to surface and groundwater. A nutrient enriched waterbody can cause an overgrowth of aquatic plants and algae. At night and on cloudy days when plants respire, they can remove too much dissolved oxygen from the water and can cause the fish, macroinvertebrates and other aquatic organisms to die.

2. Construction activities like land clearing can cause large amounts of sediment to enter streams, rivers, lakes and coastal waters. Highway and road construction are the largest type of construction occurring in the United States. Construction is estimated to contribute about five percent to the Nonpoint Source Pollution problem.

3. Forestry timber harvesting activities may create erosion problems from cleared land and from logging roads. Sediment may enter our water and in some cases, loggers place large amounts of wood debris into streams and rivers. This land-use activity affects about five percent of surface waters.

4. Urban stormwater run-off carries with it pollutants like oil, gas, antifreeze and litter. These pollutants come from streets, lawns and industrial yards. Urban run-off affects five to 15 percent of surface waters.

5. Surface mining of dirt, gravel or minerals can produce large amounts of sediment-laden or acid run-off.

6. Land disposal is usually associated with septic tank sewage disposal. Surface and underground water may become contaminated if the septic tank system is faulty, in need of pumping and in certain soil types fails to filter the sewage water before it reaches the nearest surface or underground water.

7. Hydrologic modification usually means that the path of the stream or river is changed or straightened (channelized) and soil erosion may increase due to increased speed of the water or sharp angles in a channelized stream. Streams and rivers usually slow down the water by meandering. Straightened stream channels usually mean faster water. Five to 15 percent of surface waters in the United States are affected by hydrologic modification.

Best Management Practices (BMPs) for each of these land use activities are being developed and researched to help prevent water pollution. Best management practices are the most practical, effective and economical means of preventing or reducing pollution from nonpoint sources. Examples of BMPs include-till farming, contour planting, terracing, land installation of erosion control structures like silt fences, sedimentation ponds, grass and tree buffer and filtering zones and constructed wetlands for water treatment.

Governmental agencies can't begin to solve all of these problems by themselves. The problem of Nonpoint Source Pollution exists because of human activity. In many places, people are using more clean, fresh water than is naturally supplied, and many of our fresh-water resources are being depleted or polluted. What will happen in the future if we don't take the time to help solve this problem and many more? Eventually our life on this planet will be threatened. What you do as an educator plays a very important part in the way we will all live tomorrow.

This is what this education package is all about. To help in the prevention of water pollution Nonpoint Source—and to help students make wise decisions for the future.

A Note To Teachers

Dear Teachers:

Every day we read or hear about environmental problems in our world. Some of these problems include waste disposal, the loss of rain forests, endangered wildlife, soil erosion and the pollution of our water. Even though these and many more environmental problems exist and keep growing, there is hope—because many people like you care—care enough to make a difference.

The activities in this educational package, "Oh, Give Me a Home!" were developed and field tested by teachers like you, who want to help make a difference in protecting one of our most precious natural resources—water.

The Problem:

All living things need water. Nearly three fourths of our planet is covered with water and this water has to support all living things. In the United States, almost 370,000 miles of streams and rivers are contaminated due to water pollution. Even though the government has been successful in stopping much of this pollution, we have only scratched the surface.

Water pollution can happen from a point source or a nonpoint source. Point sources are easily identifiable such as the discharge from a pipe that dumps directly into a body of water such as lakes, streams or oceans. These sources, which are slowly becoming a thing of the past include: municipal, industrial and dredging.

Nonpoint-source pollution—unlike pollution from point sources is hard to identify because it does not come from a specific location. It results from land uses such as agriculture, mining, forestry and urban activity. An example would be rainwater washing over farmlands and carrying topsoil contaminated with pesticides and fertilizers to nearby streams or ponds. In urban areas, water runoff can pick up large quantities of contaminants, such as road oil and pesticides, as it runs over lawns, through gutters, and along streets.

The Solution:

To help solve this pollution problem which is the largest contributor to river and stream pollution in the United States, everyone must help! This package was designed to help educate kindergarten and elementary students on ways they can learn to help keep our water clean and also protect our water supply for future generations.

These activities can be used as a supplement to other environmental education curricula. They are divided into three categories 1. Instructional activities 2. Student activities and 3. Extended activities/Projects.

They cover different subject areas including science, art, math, creative writing, reading and language arts.

Included in the package is a video which can be used as an introduction or for follow-up.

The Future:

We will all have a future with water as well as other natural resources if we take steps to educate ourselves and most of all—our children on caring for and managing wisely our natural endowment, our productive resources.

As teachers you have one of the greatest challenges in not only educating but in helping to create a sense of stewardship in your students to protect and conserve our future.

The first step towards stewardship (a sense of duty to care for and manage wisely our natural resources), is awareness. If you only use one lesson in this package, you have taken that first step.

The Chinese philosopher Lao-Tsu wrote over several thousand years ago:

In the end, we will conserve
only what we love . . . we will
love only what we
understand... we will
understand only what we are
taught.

My personal thanks to all that helped with this project. I hope you enjoy this package!

Jeannine May
Project Coordinator
Public Affairs Specialist
USDA, Soil Conservation Service

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Glossary

Resources

RECYCLED WATER

Subject: Science, Language Arts,
Art, Math, History
Teaching Time: One Class Period
Focus: Run-off, Stream, Lake,
Evaporation, Water Vapor, Cloud
Formation, Precipitation

Instructional Activity # 1

Curriculum Objective: Recognize the water cycle. Identify the positive and negative aspects of man's impact on the environment and its effect on living things.

Learning Objective: To make students aware of the fact that water is a non-renewable resource.

Teacher Tip:

This can be done as an introduction to the entire Nonpoint Source Pollution concept. It shows the importance of learning the concept.

Teacher Background:

For information about the water cycle see the USDA SCS brochure "Conservation and the Water Cycle." (See Resources)

Materials

- * Globe
- * Water Cycle diagram

Sample Questions

1. What percentage of the world's water supply is in the oceans? What would make this water unusable? (salt water, polluted, icebergs, etc.)
2. What are the three sources of freshwater?
3. What is groundwater?
4. Where does the water go when it evaporates?

Learning Procedure

1. Use a globe to show students that three fourths of the planet earth is covered in water.
2. Use a diagram of the water cycle to show the continuous recycling of water upon the earth.

3. Point out that all water that evaporates will return to the earth in the form of rain, hail, sleet or snow. The earth does not generate new water, therefore this water must be purified naturally through the evaporation process. As the water becomes more polluted, the more difficult it is to purify naturally.

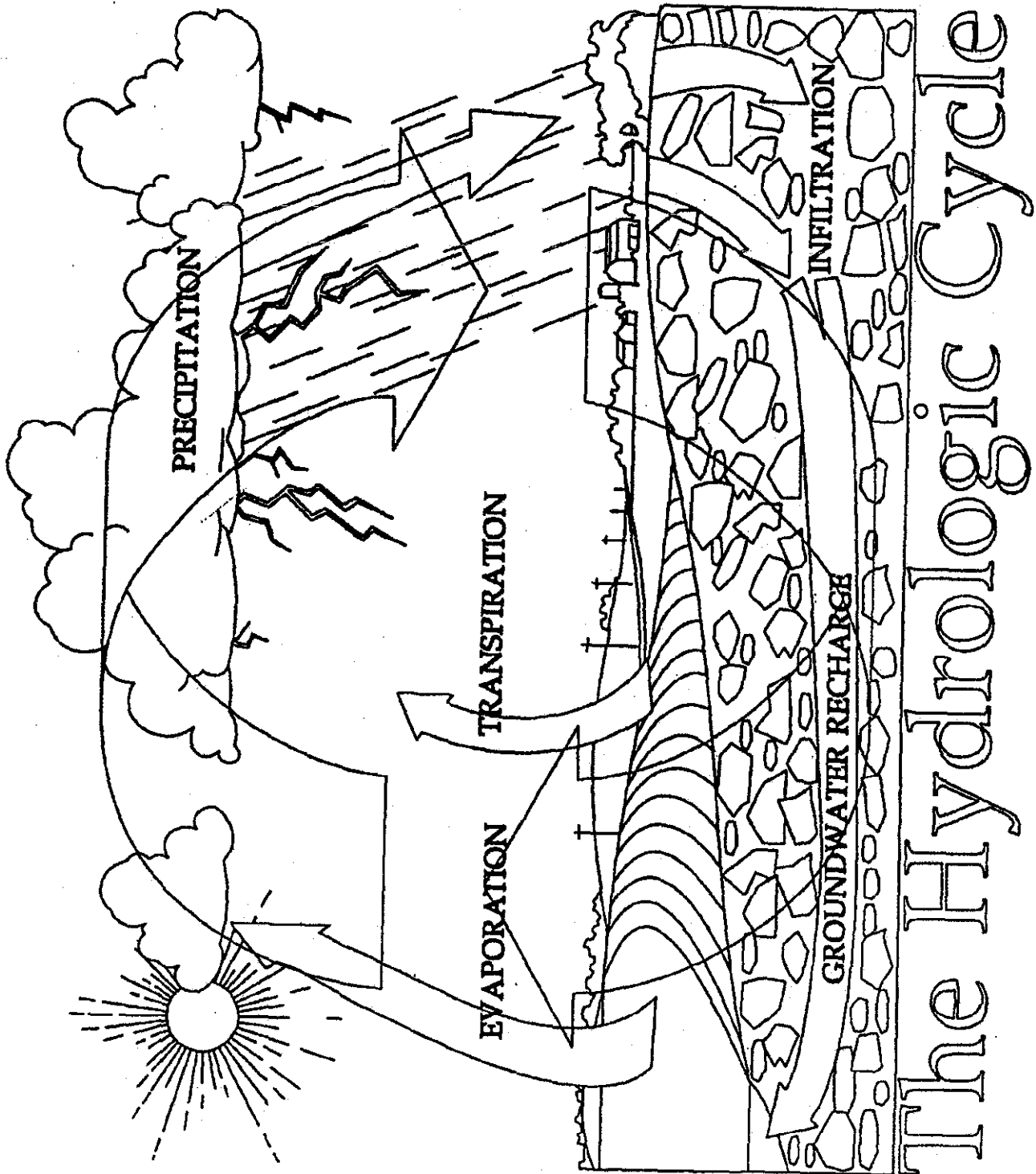
4. Tell the students as the world's population increases, so does the need for more water. It is man's obligation to return water to streams, lakes and oceans as clean as possible with the least pollution.

Supplemental Activities

1. Draw the water cycle and label the parts.
2. Draw a mural showing a time line from prehistoric to modern times. Show activities occurring in the same water throughout time.
3. Write stories or poems.
4. Conduct a science experiment to test the evaporation rate of fresh water and contaminated water. Place information on a graph.
5. Have students make a rain gauge and measure rainfall.
6. Use Activity # 9 "Don't Drink it Up". An experiment involving surface water - groundwater interaction and a portion of the water cycle. Groundwater recharge.
7. Use a glass container with water to demonstrate evaporation and condensation of water vapor at the top of the jar. Jar must be sealed.

Resources

Brochure, "Conservation and the Water Cycle," USDA Soil Conservation Service, 1988, U.S. Department of Interior/ U. S. Geological Survey



The Hydrologic Cycle

HAPPY TURTLE - SAD TURTLE

Subject: Art, Science, Language Arts
Teaching Time: One or Two Class Periods
Focus: River, Stream, Lake, Pond, Pollution,
Water Quality, Nonpoint Source Pollution

Instructional Activity #2

Curriculum Objective: Match an animal with its habitat and relate the habitat to the animal's need for food, shelter and space. Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Identify the interdependence of organisms in food chains, food webs and energy pyramids. Consumer Science: Environmental Problems.

Learning Objective: The student will identify Nonpoint Source Pollution items that enter our bodies of water after viewing the video, "Oh, Give Me a Home!"

Teacher Tip

This can be used as an introduction to the Nonpoint Source Pollution concept.

Teacher Background

Review the video, "Oh, Give Me a Home!"
Read the book, Lester and Clyde, see references.

Materials

* Video, "Oh, Give Me a Home!"
* Art materials to create a body of water, nonpoint source pollutant items (soil in self-sealing bags, oil cans, soft drink cans, fertilizer bags, six pack plastic drink rings)

Sample Questions

1. What animals live in and around bodies of water?
2. Why is it important to keep these bodies of water clean for animals?
3. How can we help keep water clean for animals?

Learning Procedure

1. Introduce the lesson by viewing the video on Nonpoint Source Pollution, "Oh, Give Me a Home!"
2. Discuss the video to check for understanding. Ask the following questions.

1. What made the turtle sad in the video?
2. What would make the turtle happy?
3. Divide a bulletin board in half. On one side label the board "Happy Turtle," and the other side "Sad Turtle."

Collect items of NPSP to attach to the "sad" side. On the "happy" side, let the students help decorate the clean stream with flowers, happy fish, etc. (macroinvertebrates i.e. aquatic insects and crustaceans)

Supplemental Activities

1. Charting - Using pictures, you can do comparison charting of good things/bad things for our water. Chart these.
2. Have students complete page 4 in the activity booklet, "Water and Me." (See Resources)

Resources

Activity booklet, Water and Me, National Association of Conservation Districts
Lester and Clyde, by James Reece, Scholastic

A HOME FOR SWAMP CREATURE

Subject: Science, Art
Teaching Time: One or Two Class Periods
Focus: Wetland, Bog, Marsh, Swamp, Lagoon, Water Quality, Habitat, Ecology, Environment

Instructional Activity # 3

Curriculum Objective:

Identify at least 3 animals that live in water. Identify plants that live in water. Match an animal with its habitat and relate the habitat to the animal's need for food, shelter and space. Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Wetland plants help soak-up pollution and filter the water. Wetlands slow water down and allow dirt (soil) and other solids to settle.

Learning Objective:

The student will identify terms related to wetlands: bog, marsh, swamp, lagoon. The student will identify the need for wetlands.

Teacher Tip: Brainstorm "swamp", teacher records all student comments on chart paper.

Teacher Background:

Wetland is a general term describing land that is sometimes or always wet. They are important "in-between" places located between open water and dry land.

A wetland area supports predominantly aquatic vegetation and hydric (wet) soils, and is permanently or seasonally saturated with water.

Wetlands make take the form of marshes, wet meadows, swamps, bogs, oxbows, and similar areas. Some stay wet all year, while others may be seasonal.

Wetlands serve as a natural system for flood control, water purification, ground-water recharge, soil and riverbank erosion control and wildlife food chains and habitat.

Wetlands and floodplains can be compared to giant sponges, soaking up the overflow of a river, storing and delaying floodwater, trapping sediments for the river water, and allowing the water to seep slowly into the underground water table or aquifer.

Wetlands also provide breeding and wintering grounds for millions of migratory waterfowl and shorebirds.

Our nation has now come to realize that wetlands have great value in their natural state, and they are now protected by laws. According to the U.S. Fish and Wildlife Service, the United States has lost more than half of the 200 million acres of wetlands that were originally present in the lower 48 states when European settlement began. During the past 200 years many wetlands were drained because these areas were considered waste-lands-useless swamps serving as sources of mosquitoes and flies. Agriculture has been responsible for a vast amount of losses, as farmers drained wetlands to plant crops. Wetlands also have been drained and filled in as cities, shopping centers and industries. Nearly one-third of the nation's endangered and threatened species of plants and animals live in wetlands as well.

Materials

* Paper bags
* Art scraps, construction paper, yarn, buttons, etc.

Sample Questions:

1. What types of animals live in wetlands?
2. Why are wetlands important to animals as well as humans? Discuss impact of wetlands loss on animals and humans.
3. How do wetlands help clean surface waters and help prevent pollution from entering streams, groundwater (underground water) and the ocean?

A HOME FOR SWAMP CREATURE continued

Learning Procedure

1. The teacher will introduce the concept of "bog" by reading *Cranberry Halloween* by Harry Devlin.
2. The importance of wetlands to our ecology will be explained including how they help improve water quality, provide habitat for plants and wildlife and reduce flood damage.
3. Students will be involved in creating a home for "Swamp Creature" whose wetland home has been destroyed by development for farming or construction. Students will research plants and wildlife native to wetlands and create a bulletin board or diorama for a habitat.
4. Each student will create a "Swamp Creature" using paper bags and scrap materials.

Supplemental Activities

1. Students may write a story about "Swamp Creature" describing how it feels about losing its home and act it out as a play.
2. Students may create other characters that live in the swamp and give them names, such as "Lagoon Goonie," or "Marsh Monster."
3. Have students write a poem, "Wetlands are Wonderful."

Resources

Mississippi Department of Environmental Quality, USDA Soil Conservation Service, Wiley and the Hairy Man, Molly Bang, Liza Lou, Mercer. *Cranberry Halloween*, Harry Devlin; *America's Wetlands, Our Vital Link Between Land and Water*, EPA Office of Wetlands, Office of Water, Washington, DC 20460, Feb. 1988, OPA-87-016. Public Information Center (PM-211B) U.S. EPA 410 M Street, SW, Washington, DC 20460.

Author: Mary W. Lee

WETLAND WORD SEARCH

Subject: Science, Language Arts

Teaching Time: One Class Period

Focus: Swamp, Ecosystem, Wildlife, Recreation,
Bog, Coastal, Hunting, Flood Protector, Tourism,
Marsh, Habitat, Lagoon, Inland, Fish, Wetland

Instructional Activity # 4

Curriculum Objective: Identify plants that live in water. Match an animal with its habitat and relate the habitat to the animal's need for food, shelter, water and space. Identify positive and negative aspects of man's impact on the environment on living things.

Learning Objective: The student will identify terms related to wetlands.

Teacher Tip:

This can be used as an introduction to a unit.

Materials

- Worksheet
- Pencil

Learning Procedure

1. Have students circle the wetland terms in the find a word puzzle.
2. For evaluation, the student will identify fourteen terms.

Resources

America's Wetlands, EPA

Author: Mary W. Lee

Wetland Word Search

A Z X O F L O O D P R O T E C T O R M G R
G T S W A M P J K Z N I B O G P R X L M S
R L J X I O Q Y S J I C O A S T A L S T G
O U V A C W X H A B I T A T N O I J K P T
U I N L A N D O M N L T X R I O N J F P O
N E C O S Y S T E M I O I L M X O P I T Z
D L A G O O N R O X I J M A R S H I N S T
W E T L A N D J C R X P L O J N I R Y H C
A N I M P X L R S T I L A J X M N S X P O
T O U R I S M O H U N O H U N T I N G O E
E I L P Q T L B N C D G X P W L Y M O O P
R E C R E A T I O N P T U G J L R K B V D

Directions: Find the following words related to wetlands in the puzzle. Restore your wetland by circling the correct term.

SWAMP
ECOYSTEM
WILDLIFE
RECREATION
BOG
COASTAL
HUNTING
WETLAND

FLOOD PROTECTOR
TOURISM
MARSH
HABITAT
LAGOON
INLAND
FISH

SOME THINGS JUST DON'T MIX

Subject: Science, Choral Music
Teaching Time: One Class Period
Focus: Toxic, Recycleable,
Aquifers, Ground Water, Water Pollution

Instructional Activity # 5

Curriculum Objective: Recognize the water cycle. Identify the positive and negative aspects of mans' impact on the environment and its effect on living things.

Learning Objective: The students will demonstrate how water and oil separate when placed together.

Teacher Tip: Use only one cup of oil in a whole group discussion and demonstration. Ask for used oil cooking from your school's cafeteria. This will give the water a darker color.

Dip a feather in clean water and then in the oily water to show how birds are affected by oil spills.

Write the poem, "Randolph Raindrop" on chart paper and use as a choral reading activity.

Teacher Background: Many of us are concerned when we hear or see the damage that has been done after a supertanker has had an oil spill. But few of us realize what impact we have on our water by poor waste management practices.

* Used automotive oil is one of the single largest source of oil pollution in our waterways. Most is caused by people who change their own oil and dump it.* One pint of oil can produce a slick of approximately one acre of surface water.

* Used oil can be reprocessed into a fuel oil.

* To recycle used automotive oil, take it in a clean, sealed container, such as a milk jug, to the nearest recycling center or service station.

* Used oil can re-refined into lubricating oil.

Materials

- * Water
- * Cooking oil Jars
- * Food Coloring
- * Paper and Colored Markers
- * Poem, "Randolph Raindrop"

Sample Questions

1. What happens when oil and water mix?
2. Where does rain go when it falls on the street?
3. When your parents change the motor oil in their cars, trucks, motorcycles or boat, what should you do with it? What should you not do with it? Why?

SOME THINGS JUST DON'T MIX continued

Learning Procedure

1. Divide students into groups of four. Provide each group with a jar filled with water. Add 1 drop of food coloring to each jar.
2. Let each group add cooking oil (provided in small containers) to each jar of water. Note: You may want to substitute sifted flour or chalk dust for oil.
3. Ask the students what happens to rainwater when it runs off of streets? Where does it go? Does the oil and water mix? Where does the oil on the streets come from?
4. What mixes with the rainwater other than oil that empties into our lakes, streams and oceans?
5. Read the poem, "Randolph Raindrop." (See Attached) Discuss why rainwater is important for our future.

"RANDOLPH RAINDROP"

When I fall from the clouds
I hope to land on a nice piece of
ground.
For there I can help plants grow or
travel down streams wherever they go.

Often we raindrops just fall on the streets
and that's where unfriendly pollutants we meet.
Oil and petroleum and other toxic wastes are the kinds of
pointless problems we raindrops must face.

Rain is recyclable, natural, 100% pure,
but most importantly of all, —it's our
FUTURE!

Supplemental Activities

1. To teach density, add molasses to the oil and water mixture. Try floating different objects on the liquid layers. Use a cork, a piece of candle, a grape, a metal object. Make a chart of the objects that float.
Ask the students how an oil slick affects the ocean.
How hard is it to clean up an oil slick?
2. Students will draw and label a diagram of a water and oil combination to replicate the class demonstration.

Resources

Walpole, Brenda. 175 Science Experiments to Amuse and Amaze Your Friends,
Random House, New York. Mississippi Department of Environmental Quality

CLEARCUT CALAMITY

Part 1

Instructional Activity # 6

Subject: Art, Science

Teaching Time: One Week, Five Class Sessions

Focus: Nonpoint Source Pollution, Habitat, Erosion, Run-off, Ground Cover, Sediment, Aquifer, Silt, Infiltration, Rural, Urban, Channeling, Toxic, Berm.

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Consumer Science - Environmental Problems.

Learning Objective: To introduce students to damaging effects of Nonpoint Source Pollution caused by construction of a planned community. To introduce students to new terminology and physical conditions.

Teacher Tip

Contact the Soil Conservation Service office in your county for more information on land use planning.

Teacher Background

EPA Journal, Volume 17, Number 5, November-December, 1991

Materials

- * Chalkboard
- * Graphic Aids (Markers and Bulletin Board Paper)
- * Film (The Lorax)
- * Video (Oh, Give Me a Home!)
- * Worksheet of vocabulary
- * Resource people, USDA Soil Conservation Service, USDA Forest Service, Mississippi Forestry Commission

Sample Questions

1. What causes erosion?
2. What animals live in the forest?
3. What products do we get from trees?
4. What necessary environmental precautions do contractors need to take when building?

Learning Procedure

Day 1 1. Teacher will show video or read the book, The Lorax. 2. Students will define vocabulary and create a word search with words.

Day 2 1. Compare and contrast differences in urban and rural settings. List on board.

Day 3 1. Students will prepare a list of relevant questions for general contractor/builder/developer about planned construction. 2. Resource person gives presentation of on-site building.

Day 4 1. Divide students into small groups and brainstorm effects of site preparation when building. The effects are a. erosion problems b. clear cutting c. disrupted habitats d. channeled run-off into creeks. 2. Let groups report findings.

Day 5. Grades K-3 1. Create a mural demonstrating Nonpoint Source Pollution caused by a planned community.

Grades 4-6 1. Groups from Day 4 design a planned community that is constructed without Nonpoint Source Pollution. Have students display products made for teacher and student observation.

Supplemental Activities

1. Take a field trip to a building site to see possible effects of construction on lakes and streams downstream.

2. Have students locate a construction site near their homes. (Road construction, new subdivision, shopping centers, etc.) Students will report back to class on construction activities and bodies of water (lakes, streams, rivers, etc) close to these sites. What possible effects is construction having on these bodies of water?

Resources

EPA Journal, Volume 17, Number 5. November-December, 1991.

The Lorax, Dr. Seuss. USDA Soil Conservation Service, "Land Use Planners: Soil Surveys Can Help You," (1990).

FLIP ME OUT

Part 2 Clear-cut Calamity

Subject: Art
Teaching Time: 45 minutes

Instructional Activity # 7

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and its effect on living things.

Learning Objective: Students will construct a flip book to show the negative effects on Nonpoint Source Pollution in a planned community.

Teacher Tip

This unit is to be used after "Clear-cut Calamity."

Teacher Background

Materials

- * Construction Paper
- * Ditto Paper
- * Staples
- * Crayons

Learning Procedure

1. Discuss background material from unit "Clear-cut Calamity" in the community.
2. Students will create their flip book beginning with a picture of a natural setting. Each page will depict depletion of natural resources. The final page will show a degraded construction site. (erosion, polluted water, etc.)
3. Students will demonstrate their flip book to the class. Teacher will determine knowledge and understanding demonstrated by the finished product.

Supplemental Activities

- K-1 Create a "picture book" of magazine pictures depicting a good environment.

Resources

EPA Journal, Volume 17, No. 5 Nov./Dec. 1991, 22K-1005.

Authors: Erica Graham, Judy Martin, Beverly Richardson

DON'T TAKE MY SPACE!

Subject: Language Arts
Teaching Time: One Class Period
Focus: Refer to "Clearcut Calamity."

Instructional Activity # 8

Curriculum Objective: Match an animal with its habitat and relate the habitat to the animal's need for food, shelter and space. Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Consumer Science: Environmental Problems.

Learning Objective: Students will demonstrate an understanding of damaging effects of Nonpoint Source Pollution on the environment caused by construction.

Teacher Tip

This unit should be used after different types of Nonpoint Source Pollution have been introduced. The roleplay activity is advised for levels K-6. The research activity is recommended for levels 5-6.

Some trees must be cut during construction activities. It would be good if more of them could be saved. Sometimes the operation of heavy equipment will kill trees if the soil becomes too compacted over the roots or if the tree is scarred by the dozer work.

Teacher Background

For information effects of construction on water pollution, see EPA Journal, Volume 17, Number 5, November, December, 1991.

Materials

** Visual effects for roleplaying*

Sample Questions

- 1. How would you feel if you were a bird and a developer cut your tree down?*
- 2. What other wildlife would be affected by construction?*
- 3. What are ways that a landowner could help the environment in which he was developing into a community?*

Learning Procedure

1. Roleplay from the viewpoint of:

- 1) Bird*
- 2) Tree*
- 3) Squirrel*
- 4) Soil*
- 5) Land Developer*

1. A planned community is about to be constructed on your site. Convince the land developer that he can build a planned community without contributing to the Nonpoint Source Pollution community problems.

2. Students will research "What land developers and contractors can do" to minimize Nonpoint Source Pollution in planned communities.

May additionally want to build a model of a planned community with practices in place to minimize NPSP. Reinforce the research.

Resources

EPA Journal, Volume 17, Number 5. November, December, 1991.

Authors: Erica Graham, Judy Martin, Beverly Richardson

DON'T DRINK IT UP

Subject: Science

Teaching Time: One or Two Class Periods

Focus: Ground Water, Pollution, Contamination, Chemicals, Fertilizer, Pesticides, Herbicides, Leach

Instructional Activity # 9

Curriculum Objective

Identify the positive and negative aspects of man's impact on the environment and its effect on living things.

Learning Objective

To make students aware of how the application of agricultural chemicals to crops can leech into certain soil types and into the ground water.

Teacher Tip

This activity shows how pollutants can contaminate drinking water. We depend on ground water in Mississippi for most of our drinking water supply.

Teacher Background

For information on ground water contamination, contact the Mississippi Department of Environmental Quality.

Materials

- * Clear plastic container or glass container (beaker)
- * Hand held spray pump from a household cleaner bottle
- * Rocks or gravel (approximately 1/2" in diameter)
- * three coffee filters (like those used in a Mr. Coffee)
- * Sand
- * Water
- * Food Coloring
- * White cloth or paper towels

Sample Questions:

1. What is ground water?
2. What is an aquifer?
3. What are some ways our ground water can become contaminated?

Learning Procedure

(experiment design) also see illustration

1. Pour in about one-half to three-quarter of an inch of gravel into the bottom of the clear container.
2. Cut three coffee filters to fit the container. The filters should cover the entire surface on top of the gravel.

3. Punch a hole through the three coffee filters with the spray pump or a hole punch. (Be careful not to make the hole too big.) The purpose of the filters is to keep the sand out of the pump, much like the bottom of a well pipe filters solids from the underground water before it is pumped up through the pump.

4. Place the pump in the container so the coffee filters rest on the gravel and the pump straw is near the bottom. (Leave enough space for water to enter the pump.) Pour the sand on top of the coffee filters.

5. Mix about one quart of water (consider the size of your container) with either **red, blue or green** food coloring. (Make the color dark.)

6. Pour the colored water into the container. Watch the water flow through the sandy soil, through the coffee filters and into the gravel below. (This is similar to how different soil and rock layers appear under the ground.) Explain to the students that farm and lawn chemicals and fertilizers (represented by the color) may become dissolved in water found on the surface of the earth (**surface water**) and this may then soak (**percolate or leach**) down into water found under the ground (**groundwater**) in Mississippi, and in most states, 95% of our drinking water comes from groundwater. This is why it is important to avoid pouring household chemicals like gas, antifreeze, oil, paint brush cleaner and other chemicals on the ground. It is important to dispose of them properly or to recycle them.

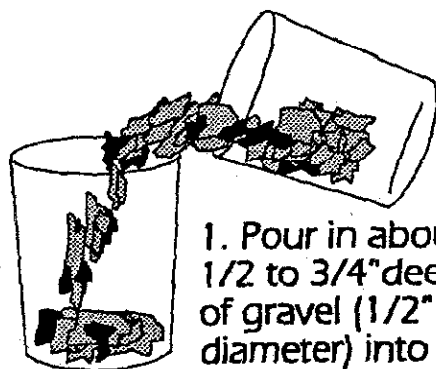
7. Begin to pump the household cleaner handle. Spray the water onto a white cloth or paper towel to demonstrate how a drinking water well would pump **groundwater** with pollution in it to the surface of the earth. Sandy soil is especially susceptible to this type of pollution problem because it has a lot of space between the pieces of sand and gravel for water to flow. This is called **porous** soil. Other soil types like clay and chalk are not susceptible to this type of pollution because there is very little space and water can not flow through easily.

Resources

Mississippi Department of Environmental Quality-Ground water aquifer model for demonstration, Mississippi Cooperative Extension Service, U. S Geological Survey-film, "Ground Water and Rural Home Owners." U.S. Geological Survey, Books and Open-File Reports Section, U.S. Geological Survey, Federal Center, Box 25425, Denver, CO 80225.

DON'T DRINK IT UP

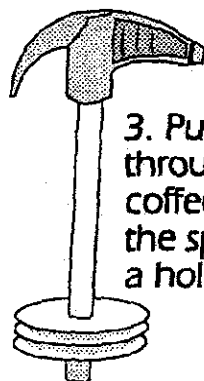
This experiment demonstrates how surface pollutants may contaminate groundwater (underground water).



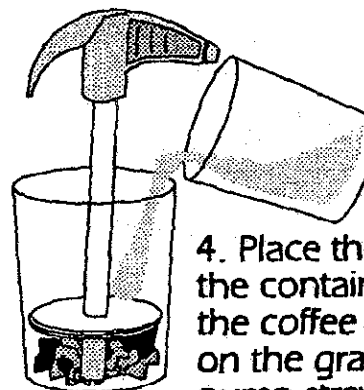
1. Pour in about 1/2 to 3/4" deep of gravel (1/2" diameter) into the bottom of the container.



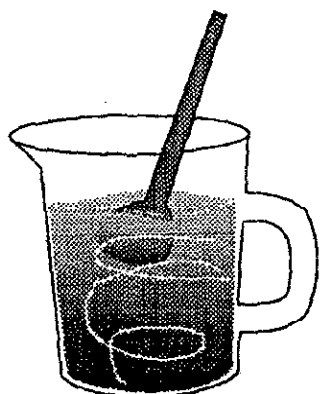
2. Cut 3 coffee filters to fit in the container.



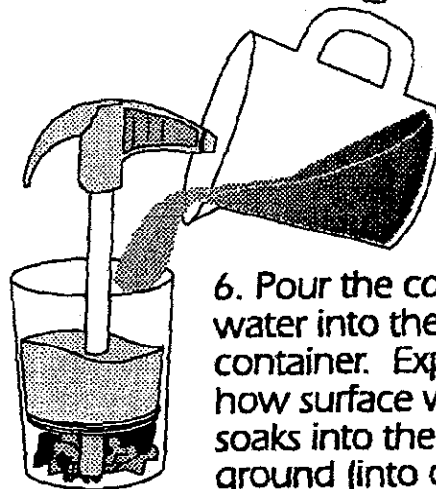
3. Punch a hole through the 3 coffee filters with the spray pump or a hole punch.



4. Place the pump in the container so that the coffee filters rest on the gravel and the pump straw is on the bottom. Pour in sand.



5. Mix about one quart of water with red, blue or green food coloring. (Make the color dark.)



6. Pour the colored water into the container. Explain how surface water soaks into the ground (into our drinking water.)



7. Spray the colored water from the pump onto a white cloth to show that surface water soaks into sandy soil.

DON'T DRINK IT UP

POLLUTION'S A PUZZLE

Subject: Vocabulary, Reading
Teaching Time: One Class Period
Focus: Nutrients, Ground Water, Agriculture, Pollutant, Landfill, Pesticide, Waste, Sediment, Ecology, Bacteria

Instructional Activity # 10

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Consumer Science: Environmental Problems and Soil Conservation

Learning Objective: The students can define 10 terms that pertain to Nonpoint Source Pollution.

Teacher Tip

This can be used as an introduction to a unit on Nonpoint Source Pollution.

Materials

- * Pencils
- * Crossword puzzle sheet

Learning Procedure

1. Mimeograph crossword puzzle. Have students study the terms and definitions and be able to fill in the puzzle.
2. Grades 2-3 may want the terms written on the puzzle to choose the correct word.

POLLUTION'S A PUZZLE

GROUNDWATER	POLLUTANT
ECOLOGY	AGRICULTURE
PESTICIDE	SEDIMENT
WASTE	LANDFILL
BACTERIA	NUTRIENTS

Across

1. Water that lies under the ground in natural reservoirs such as springs and wells.
2. Any substance that can make air, land or water dirty or impure.
3. A poison that is used to kill pests such as insects, rodents and weeds.
4. Matter falling to the bottom of a body of liquid.
5. Science that studies the ways in which organisms and environment are interrelated.
6. Microscopic vegetable organism

Down

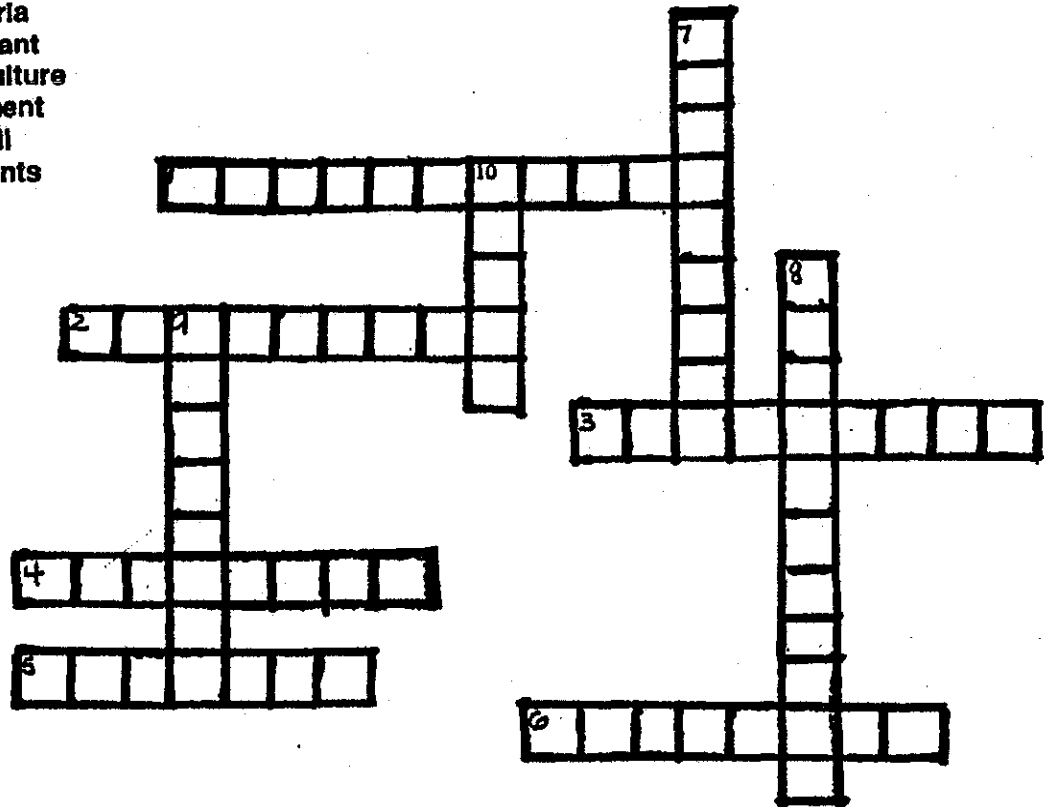
7. Nourishing
8. Science or occupation of farming
9. An enormous pit where trash is buried under shallow layers of dirt
10. Needless consumption of Resources: Webster's New Compact Dictionary

Resources: Webster's New Compact Dictionary

Author: Nancy Granholm

Pollution's a Puzzle

groundwater
ecology
pesticide
waste
bacteria
pollutant
agriculture
sediment
landfill
nutrients



ACROSS

1. Water that lies under the ground in natural reservoirs such as springs and wells.
2. Any substance that can make air, land or water dirty or impure.
3. A poison that is used to kill pests such as insects, rodents and weeds.
4. Matter falling to the bottom of a body of liquid.
5. Science that studies the ways that organisms and environment are interrelated.
6. Microscopic vegetable organism

DOWN

7. Nourishing
8. Science or occupation of farming
9. An enormous pit where trash is buried under shallow layers of dirt.
10. Needless consumption of expenditures

YOU'RE IN MY SPACE

Subject: Whole Language, Art
Teaching Time: Two Class Periods
Focus: Forest, Trees, Stump, Wildlife,
Habitat, Construction, Timber, Land

Instructional Activity # 11

Curriculum Objective: Match an animal with it's habitat and relate the habitat to the animal's need for food, shelter and space. Identify the positive and negative aspects of man's impact on the environment and it's effect on living things. Consumer Science: Environmental problems.

Learning Objective: The student will be able to demonstrate knowledge of how construction effects wildlife.

Teacher Tip

The debate is recommended for grades 5-6. Provide a variety of wildlife species that may live in this given habitat area. Let the students choose what species they want to be. Let them investigate about their species choice and report what they eat, where they live and different habits they have.

Teacher Background

Teacher needs to discuss how much space is needed for different wildlife species. For information see National Wildlife Educational Materials. Contact the Mississippi Museum of Natural Science for free loan audio visual programs.

Materials

- * Refrigerator box
- * Markers

Sample Questions

1. What does wildlife need for survival? (food, water, shelter, space, arrangement)
2. When land is cleared for a shopping center, where do the animals that live there go?

Learning Procedure

1. Discuss how construction destroys an animal's habitat.
2. After gathering information, students will write a play depicting animals losing their homes. Example: Using a large cardboard box have students draw and color a forest scene on one side and construction sites on the other.
3. Have students act as wildlife living in the forest.
4. As the background (box) is folded by the teacher, the animals must move closer and closer together until eventually the animals must leave.
5. Evaluate how the students felt as different wildlife species when they lost their home.
6. Discuss loss of habitat as a real threat to wildlife and humans.

Supplemental Activities

1. Design bumper stickers supporting the wildlife's habitat.
2. Design T-Shirts (wildlife prints)
3. Creative Writing: The Day I Lost My Home...
4. Debate: Group 1 — For Saving Wildlife
Group 2 - Wants to build a new factory

Resources

Mississippi Wildlife Federation, National Wildlife Federation, Project Wild, Project Learning Tree, Mississippi Department of Wildlife, Fisheries and Parks, USDA Soil Conservation Service, Developing Backyard Wildlife Habitats in Mississippi, John T. DeFazio, 1990.

Author: Cathy Butler

WATER, WONDERFUL DAY!

Subject: Science, Language Arts, Art
Teaching Time: One Class Period
Focus: Point Source Pollution, Nonpoint Source Pollution, Fertilizer, Septic Tank, Run-off

Instructional Activity # 12

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and it's effect on living things.

Learning Objective: To achieve student understanding of what Point/Nonpoint Source Pollution is.

Teacher Tip

This lesson plan is recommended for introducing the concept, Nonpoint Source Pollution and could be used as an instructional lesson.

Teacher Background

Refer to attached story, "Water, Wonderful Day."

Materials

- * Bulletin board materials
- * "My Poster About Water Pollution"
- * Classification Cards

Sample Questions

1. What types of things would make water dirty?
2. What does polluted mean?
3. How does polluted water affect them and their families?

Learning Procedure

1. The teacher will read the story, "Water Wonderful Day Or Is It?"
2. The Class will discuss the story as teacher goes back through it, pointing out instances of contribution to water pollution. The teacher points out that Point Source and Nonpoint Source Pollution will be introduced.
3. Students will then participate in creating a "teaching bulletin board" on Point/Nonpoint Source Pollution using information gained from story.

Story - "Water Wonderful Day! Or Is It?"

Supplemental Activities

1. Students will complete "My Own Poster on Water Pollution."
2. Students will use pictures depicting Point/Nonpoint situations and classify them.

References

Mississippi Department of Environmental Quality, USDA Soil Conservation Service,
Mississippi Soil & Water Conservation Commission

Authors: Pam Himebrook and Louise Autry

Activity # 12

Water, Wonderful Day!

One day two little girls named Anna and Sarah came home from school and decided to go outside and to see what was going on. As they went out the door, they saw their Dad changing the oil in the lawnmower. "May we help," they asked eagerly. "Sure!" said Dad. "Hold this pan for me while I drain the oil." Together they held the pan carefully as the oil dripped out. Suddenly their puppy, S.O.S. playfully jumped into their laps and "Oh!" What do you think? The pan of oil flew out of their hands and landed in the flower bed. Their Dad wasn't upset though. He said, "Don't worry, it will wash away." They were so relieved.

When Anna and Sarah finished helping their Dad, they decided to walk across the field to see if Grandma was home. On their way, they saw Grandpa standing by his tractor looking up at the sky. In a minute they heard a familiar sound in the distance. It was the cropduster coming in his funny airplane. How they loved to wave as the cropduster passed over Grandpa's fields. They threw up their hands and waved, jumping up and down excitedly. The cropduster waved back, then swooped low over the field, blanketing it with a cloud of white.

On their home, Anna and Sarah walked past a part of the field that was much greener than the rest. They wondered why. There was a not-so-good smell coming from that part of the field. Anna and Sarah looked at each other and held their noses. "OOOo! this must be the thing Mom and Dad call a septic tank!" They exclaimed at the same time, remembering that they had heard their parents say something about needing to get it fixed because of bad odors when the wind blew towards the house.

Anna and Sarah skipped on home stopping in the driveway to inspect a puddle. Their Uncle, who drove a big eighteen wheel tractor trailer had parked it in their driveway over the weekend. When he left, Dad had said that Uncle Sam must have a leak in his truck's engine because something black and oily was left on the concrete. Anna and Sarah noticed that after it had rained, the puddle that formed around the leak had beautiful rainbow colors in it. They stopped now to admire the pretty, shimmering colors and stir them with a stick, making them swirl. After all, the next rain might wash it away and the rainbow colors would disappear.

Anna and Sarah raced to see who would get back to the house first. When they went in, Mom asked what they had been up to. They told her all about S.O.S. causing the oil to spill, waving to the cropduster, stirring the rainbow colors and about that stinky smell out in the field. "We had a wonderful time!" They said happily.

Think about it:

1. Can you name four things wrong with Anna and Sarah's wonderful day?
2. What do you think should be done about the four "problems" in this story?
3. Do you have any of these problems where you live?

THE WORD TREE

Subject: Language
Teaching Time: One Class Period
Focus: Nonpoint Source Pollution,
Trees, Urban, Oxygen, Lungs, Mud,
Sediment, Erosion, Forest, Paper,
Air, Earth

Instructional Lesson # 13

Curriculum Objective: Consumer Science: Environmental Problems

Learning Objective: Students will recognize vocabulary words from this unit.

Teacher Tip

This lesson plan is recommended for the beginning of a unit.

Materials

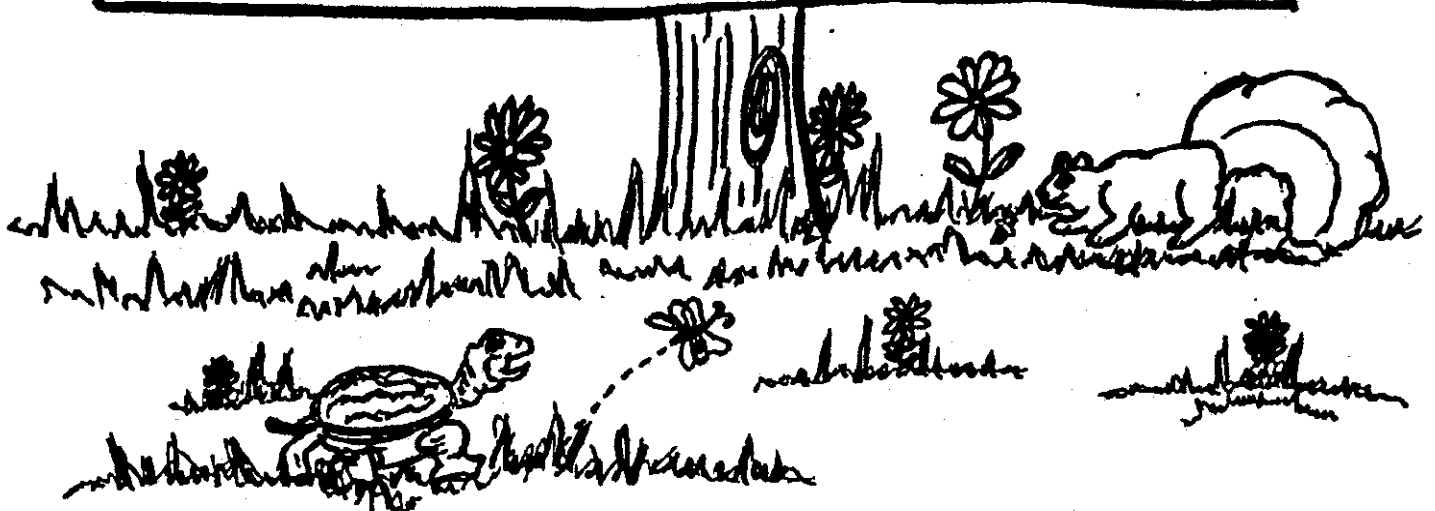
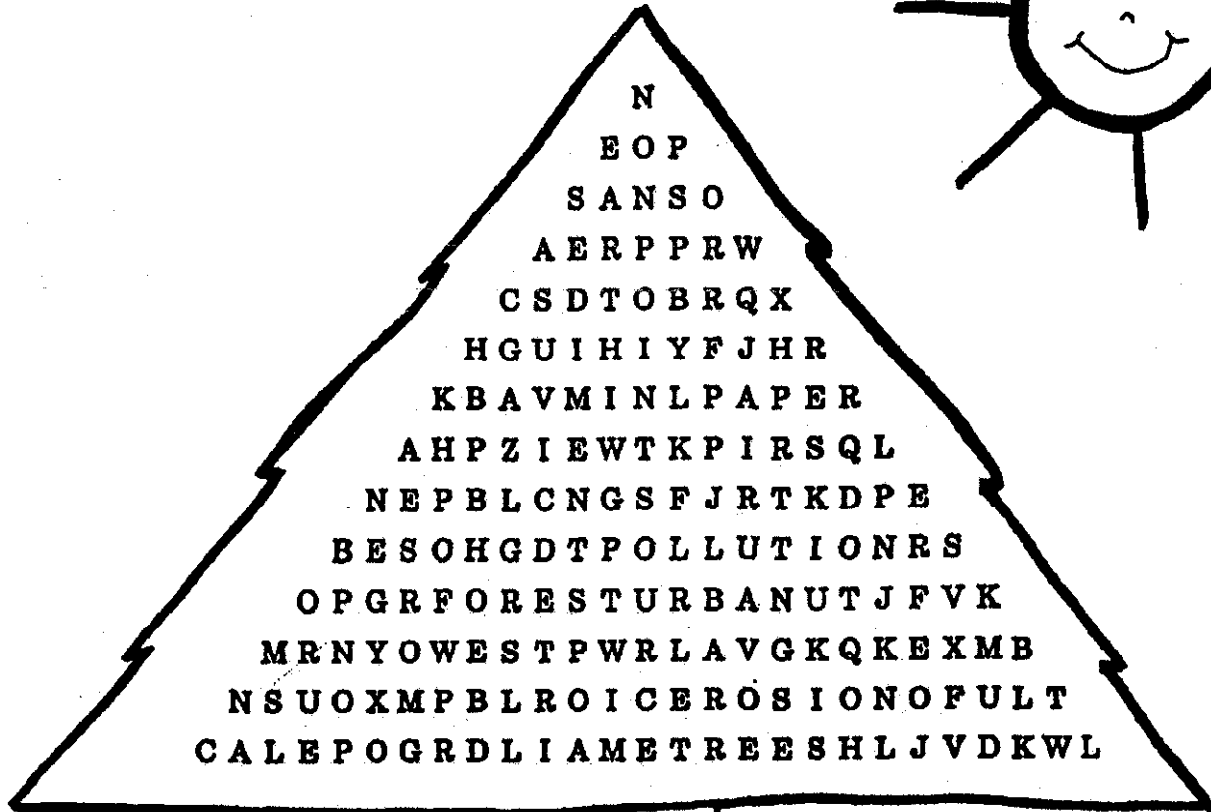
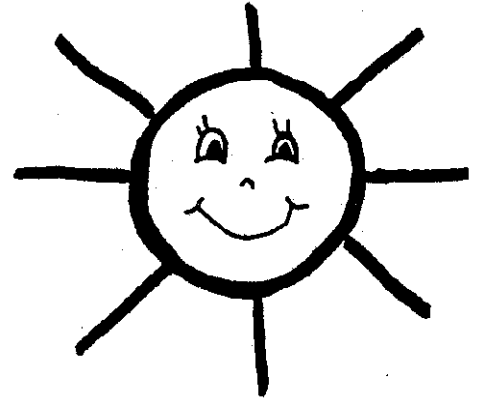
- * Worksheet
- * Pencils

Learning Procedure

1. Student will define terms.
2. Students will find vocabulary words and circle them in the word tree.
3. For evaluation, students word tree will be checked.

Author: Sherry Worsham

Activity # 13



Nonpoint Source
Pollution
Trees
Urban

Oxygen
Lungs
Mud

Paper
Erosion
Forest

Sediment
Air
Earth

PREVENT PERCOLATION

Subject: Science

Focus: Permeability, Percolation, Leaching, Run Off, Ground Water, Surface Water, Nonpoint Source Pollution, Aquifer, Water Table, Artesian Well

Instructional Activity # 14

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Consumer Science: Environmental Problems and Soil Chemistry

Teacher Tip

A sieve may be substituted for screen.

Teacher Background:

For more information on soils in Mississippi, contact the USDA Soil Conservation Service. For more information on groundwater, contact the Mississippi Department of Environmental Quality.

Materials

- * Glass pyrex dish
- * Screen mesh
- * Water
- * Food coloring
- * Different soil types (clay, sand)
- * Transparency of the water table

Sample Questions

1. What kinds of soils are most common in Mississippi?
2. What is a leachate?
3. What is ground water?
4. How does leachate affect groundwater?

Learning Procedure

1. Display transparency and explain how surface water becomes ground water.
2. Review vocabulary and concepts.
3. Demonstrate permeability. Explain its meaning.
4. Place pyrex dish with screen mesh attached across the top. Place soil on screen.
5. Mix food coloring. (This represents chemicals added to the ground.) Pour food coloring over soil.
6. If food coloring passes quickly through soil, then this soil type will not prevent permeability. If food coloring passes through the soil slowly or not at all, then this soil type will prevent permeability.
7. For evaluation, provide a diagram of surface water and ground water. Students will use a list of vocabulary words to label the steps of how chemicals enter ground water.

Supplemental Activities

1. Allow soil to dry for a day. Pour clear water over soil. If food coloring flows through, the concept of chemicals remaining in the ground for a long period of time and continues to enter ground water.

Resources

Waller, Rodger M. (1991) U.S. Geological Survey, Ground Water and the Rural Homeowner, pg. 9.

DIRTY WATER = DIRTY DUDES

Subject: Science, Social Studies,
Agriculture
Teaching Time: One Class Period
with follow up
Focus: Pollution, Chemicals,
Fertilizer, Run-off, Sedimentation,
Pesticides, Contaminate, Nitrate,
Nitrite

Instructional Activity # 15

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Identify the interdependence of organisms in food chains, food webs, and energy pyramids.

Learning Objective: Students will learn how water run-off from land – mainly agricultural land – contains chemicals that we gradually ingest. Contamination of our water gradually contaminate our bodies.

Teacher Background

In Mississippi, some of the major food crops grown are soybeans, corn and sweet potatoes. Farmers use pesticides, herbicides and fertilizers for better yields and to control pests. Water run-off from land either leaches into the soil or runs off into nearby lakes and streams. Other chemicals and fertilizers are also used by landowners to make grass grow and to control weeds and pests. These chemicals also are found in lakes and streams.

Materials

- * Stalks of celery
- * Food Coloring (red or blue)
- * Water
- * Glass

Sample Questions

1. What does contaminate mean?
2. Why are chemicals used in farming?
3. What are ways run-off can be prevented or slowed down?

Learning Procedure

1. Display a piece of celery. Ask students how does the celery get to the grocery store? Who grows celery? Why? Note: This is to stimulate students to think about agriculture.
2. Place celery in a glass of water. Note: Cut off end of celery for better absorption. Add several drops of red or blue food coloring and "pollute" the water celery is in.
3. Let celery stand for one or two days.

4. Then follow up and explain that the celery has turned "dirty" colors. Explain that many things are added to our water from run off that we cannot see. Examples: fertilizers, chemicals, pesticides. When we eat the colored celery, we would eat the food coloring which is visible, but many times we eat food that has been (contaminated)—dirty. These chemicals go into our bodies. Our bodies become (dirty). One example is nitrites from fertilizers that babies ingest in drinking water. When our bodies become too dirty we can get sick.

5. For evaluation students should explain in a short paragraph or verbally how chemicals can enter the food chain from run off water and how we gradually by eating food or drinking water, will be affected by these chemicals.

Supplemental Activities

1. Use vinegar instead of food coloring and let students take a bite of the celery after absorption has taken place.
2. Take a field trip to a farm where conservation is practiced. View terraces, grassed waterways and other methods used to prevent or slow down water run-off.

Resources

Mississippi Department of Environmental Quality, Environmental Protection Agency, USDA Soil Conservation Service

THE BUFFER TREE

Subject: Science, Ecology Unit
Teaching Time: One Class Period
Focus: Nonpoint Source Pollution, Erosion, Sediment, Buffer

Instructional Activity # 16

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Consumer Science: Study on environmental problems and soil chemistry.

Learning Objective: Students will understand how trees conserve water and reduce soil erosion. Students will understand that run off water carries sediment to streams causing Nonpoint Source Pollution.

Teacher Tip

This activity is a simple demonstration used to demonstrate soil erosion. Optional: Use another sieve and add a piece of grass sod. (St. Augustine if possible) and then compare the two.

Teacher Background

A streamside buffer forest properly managed slows run off water from hillsides preventing sediment from entering streams.

Materials

- * Sieve
- * Large pan
- * 2 cups soil
- * Water
- * Streamside Buffer Sheet
- * Art Paper and art supplies

Sample Questions

1. What is sediment?
2. How does excessive sediment affect aquatic life?
3. What is clear-cutting?
4. Why is timber harvesting necessary?
5. How does a buffer forest protect aquatic life? (tree roots provide cover for fish, especially young and aquatic insects and crustaceans.)

Learning Procedure

1. Place soil in the sieve. Hold it over the pan and pour water over it.
2. Have students note what they observe. (muddy water)
3. Explain that muddy water is the most obvious sign that erosion has taken place. Allow the water to settle.
4. Discuss the build up of sediment in streams and river bottoms.
5. Explain that the sediment chokes the oxygen supply out of the water and destroys the aquatic

habitat for fish and other aquatic life.

6. Hand out copies of "The Streamside Forest Buffer." Review this handout with students and explain that the trees near the stream slow run off water. They also trap and hold the soil. Discuss what would happen if trees were removed from streambanks. Explain that trees reduce the amount of sediment in run off water by acting like a filter.

7. For evaluation, have students draw pictures of streams with and without buffer trees. They should add wildlife species, aquatic life and insects to the protected streams. The unbuffered streams should be muddy.

8. Streambank buffer zones also create homes (habitat) for wildlife and travel corridors for wildlife.

Supplemental Activities

1. Math - If farming and improper re-forestation practices caused the loss of one inch of topsoil per year, how long would it take to lose one foot of topsoil?
2. Math - It takes about 100 years to produce one inch of topsoil. When agricultural practices began during the late 1800s there was two feet of good topsoil on our land. At the rate of losing one inch per year, how long will it take before our topsoil is depleted?
3. Students can observe and document streams near their home or school. Photographs can be taken and brought to class, posters can be made for presentation to class. Streams can be labeled as polluted from nonpoint sources or non-polluted.
4. Students can adopt a stream and clean it up through the "Save Our Streams" program, sponsored by The Izaak Walton League of America, Inc.

Resources

"Earthnotes, United States Environmental Protection Agency, 22K-1001. Fall, 1991. "Save Our Streams Program" The Izaak Walton League of America, Inc., 1401 Wilson Blvd. Level B, Arlington, Virginia 22209

THE STREAMSIDE FOREST BUFFER

The streamside forest buffer includes grass, shrubs, and trees along the stream channel which helps prevent soil, chemicals and other pollutants from entering the stream.

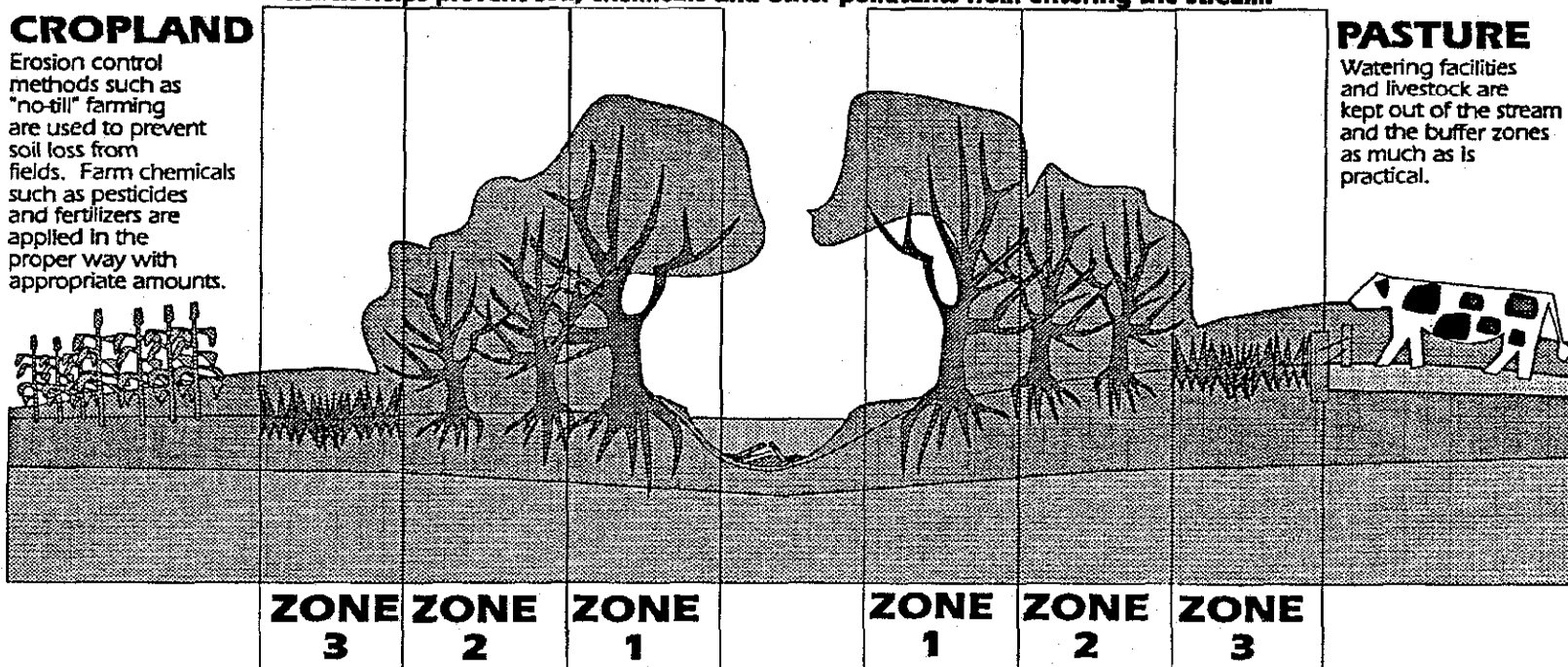
CROPLAND

Erosion control methods such as "no-till" farming are used to prevent soil loss from fields. Farm chemicals such as pesticides and fertilizers are applied in the proper way with appropriate amounts.



PASTURE

Watering facilities and livestock are kept out of the stream and the buffer zones as much as is practical.



ZONE 1 - UNDISTURBED FOREST

Trees in this zone are not harvested (cut). The large old trees have deep root systems that anchor the soil on the banks and prevent erosion.

Deep roots help soak up chemicals and other pollutants from underground water before it enters the stream. The old trees also provide shade which cools the water and increases dissolved oxygen. Trees drop leaves and limbs into streams, which provide food and homes for fish, insects, and crustaceans.

ZONE 2 - MANAGED FOREST

ZONE 2 - MANAGED FOREST - When timber harvesting occurs, older trees are cut and new young growth of trees and shrubs occurs. The younger trees soak up more chemicals and nutrients than the old trees.

Trees in Zone 1 and 2 provide excellent habitat (homes) and cover for fish and wildlife.

ZONE 3 - RUNOFF CONTROL

This zone usually contains a grass filter strip to help slow the water and its shallow root system soaks up farm chemicals which run off the field. Controlled grazing can be permitted in Zone 3 under certain conditions.

STREAM BOTTOM

When sediment, or dirt, covers the stream bottom, it smothers aquatic animals and destroys their homes. Sediment can also cause the stream to fill up with dirt, which makes it shallow and increases flooding.

EAT IT UP

Subject: Science, Art, Language Arts
Teaching Time: One Class Period
Focus: Nutrients, Fertilizer, Rainfall,
Run Off, Willow Roots, Pollution,
Pesticide

Instructional Activity # 17

Curriculum Objective: Identify the parts of a plant and state their major functions. Tell what plants need to grow. Identify the positive and negative aspects of man's impact on the environment and its effect on living things.

Learning Objective: Students will be able to learn how plants along streams and lakes absorb nutrients (fertilizers)

Teacher Background

Farms can contribute manure, fertilizers and pesticides to streams, rivers and lakes.

Materials

- * Carnations
- * Green Food Coloring
- * Peat pots
- * Water
- * Glass Container
- * Soil
- * Willow cuttings

Sample Questions

1. How do trees absorb nutrients from the soil?
2. What is a pesticide?

Learning Procedure

1. Discuss the importance of plants to man and animals.
2. Present filmstrip or video on plants. Discuss pollution and the effect it has on plants.
3. Introduce vocabulary words, write definitions.
4. Place a carnation in water to which green food coloring has been added. This will illustrate how trees absorb nutrients from the soil.
5. Select willow cuttings the length and width of a pencil. Set out in peat pots and grow in classroom until two buds appear. Have students set these out along the bank of a stream so the roots can absorb nutrients that may be in the water. Set willows five feet apart when planting on the streambank. Best to plant them in February (early spring).
6. Willow trees also help stabilize the streambank by holding the soil in place.

Resources

Mississippi Department of Environmental Quality

Author: Doris Broadus

GOING, GOING, GONE!

Subject: Science, Math
Teaching Time: One Class Period
Focus: Drinking Water, Water Conservation, Freshwater

Instructional Activity # 18

Curriculum Objective: Identify positive and negative aspects of man's impact on the environment and its effect on living things. Consumer Science: Environmental Problems

Learning Objective: Students will understand the importance of conserving and protecting water from pollution and contamination by calculating the amount and distribution of water on the earth.

Teacher Tip

This is a good activity to follow up with after Recycled Water.

For an introduction to this unit, do the following starter activity.

The Earth As an Apple

1. Use an apple, to represent the earth, and ask the questions as you slice the following amounts:

a. Cut the apple into four equal sections.

b. What percent of the earth's surface is water? 75 percent (3/4) of the apple or three sections. You will have (1/4) left, this section represents land. (Eat it or lay it aside.)

c. Using three sections of the apple, ask students what percent of the earth's water is ocean? (salt water) 97 percent.

d. Now ask students what percent is tied up in glaciers and ice caps? 2 percent. To illustrate this 2 percent, cut one of the quarter sections into four 1/8 sections. Place two of these 1/8 sections back with the 97 percent ocean water. One of the remaining two 1/8 sections represent glaciers and icecaps.

e. What is left? The last small slice, 1/8 (0.62 percent) is all that remains to represent all possible human water sources. These include surface water (lakes, rivers and reservoirs) and ground water (aquifers).

f. Peel this tiny slice and ask the question: What happens if we don't protect this valuable resource?

Teacher Background

Use "Distribution of the World's Estimated Water Supply" fact sheet (included) U.S. Department of the Interior/Geological Survey.

Materials

- * 5-gallon container
- * Water
- * Four one-cup measuring cups

* one plate

* Measuring spoons (1/4 tsp.)

* Globe

Sample Questions

1. What percentage of the world's water supply is in our oceans?
2. What is freshwater?

Learning Procedure

1. Fill a 5-gallon container with water. Label it "All of Earth's Water." Tell students this represents oceans, streams, rivers, polar regions, etc. and point these areas out on a globe.

2. Take out three cups - these represent total freshwater available (rivers, lakes, streams, underground water, icebergs).

3. Pour 1/2 of one of the three cups and pour into a fourth cup. Label the two 1/2 cups as "Total Unusable Freshwater."

Why? Because it is in Arctic regions, high mountains (unreachable). Show these areas on the globe.

4. Explain to students that this 1/2 cup (fourth cup) stands for freshwater. How much is drinkable?

5. Have students take 1/4 tsp. out and pour it on a plate. Label the other 1/2 remaining cup as "Freshwater-usable but too polluted to drink or too hard to obtain."

6. Tell students that this 1/4 tsp. is all that is available for us to consume. Ask, "Where is this water?" (inground, aquifers, reservoirs, lakes)

7. Discuss the pollution problems that we have with water and what causes this pollution.

8. Ask for solutions.

9. For evaluation have students try the demonstration in groups.

Supplemental Activities

1. Use "Distribution of the World's Estimated Water Supply" sheet and have students calculate total water supply.


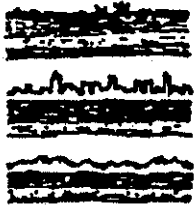

Resources

"Distribution of the World's Estimated Water Supply," U.S. Department of the Interior/Geological Survey
"Down The Drain" video, 1991. Children's Television Workshop. (30 minutes.) Call EPA at 513-569-7771 for ordering information. Also available for loan from USDA Soil Conservation Service.

Author: Jeannine May

GOING, GOING, GONE!

Distribution of the World's Estimated Water Supply

	Location	Percentage of Total Water
	Surface Water	
	Freshwater lakes	.009
	Saline lakes and inland seas	.008
	Average in stream channels	.001
	Subsurface Water	
	Vadose Water (Includes soil moisture)	.005
	Ground water within depth of half a mile	.31
	Ground water - deep lying	.31
	Other Water Locations	
	Icecaps and glaciers	2.15
	Atmosphere (at sea level)	.001
	World ocean	97.2
	TOTAL (rounded)	100

U.S. Department of the Interior/Geological Survey

Of the world's water supply, only some .6341 percent is fresh and found in freshwater lakes, in streams and channels, in vadose form (just below the surface and in the soil), and under the ground to a depth of one mile. The water locked up in glaciers is not available.
(U.S. Department of the Interior/Geological Survey)

HOW CAN I HELP?

Subject: Science
Teaching Time: One Class Period
Focus: Pollution, Ecology, Ozone

Instructional Activity # 19

Curriculum Objective: Consumer Science: Environmental problems.

Learning Objective: On a bulletin board, the student will locate and pinpoint 5 ways to protect the Earth using yarn and thumb tacks.

Teacher Tip

Use this lesson plan after instruction on types of Nonpoint Source Pollution.

Materials

- * Bulletin Board paper
- * Poster of the Earth
- * Yarn
- * Thumb tacks
- * Letters for the title, "How Can I Help?"
- * Border

Sample Questions

1. What is water pollution?
2. What are ways you can help save the Earth?

Learning Procedure

1. Prepare bulletin board with white paper background. Put up title, "How Can I Help?" across the top.
2. Put a large poster of the Earth in the center.
3. Let students either draw or cut pictures out of magazines of ways they can help the environment by preventing Nonpoint Source Pollution.
4. Place an answer card at the bottom right of the bulletin board.
5. As each student connects their picture to the Earth with yarn and thumbtack, student will identify ways on answer card.

Example of Answer Card

1. Plant a tree.
2. Recycle
3. Keep streams clean
4. Plant grass.

PICTURE THIS!!!

Subject: Science, Language Arts, Art
Teaching Time: One or Two Class Periods
Focus: Thunderstorms, Aquifer, Bath, Pond, Swamp, Groundwater, Contaminate, Precipitation, Sea Water, Fish, Erosion, Wastewater, Waterbug, River, Rain, Run-off, Landfill, Stream, Drink, Ocean, Transpiration, Evaporation, Splash, Wetland, Soil, Cloudburst (Use these words and more found in the glossary.)

Student Activity # 20

Curriculum Objective: Consumer Science: Environmental Problems

Learning Objective: Students will identify water-related terms by illustrations.

Teacher Tip

This would be good for a review at the end of this unit or for an introduction at the beginning.

Materials

- * Timer, watch with second hand
- * Paper, pencils or pens
- * "Picture This" playing cards-3 1/2 x5 index cards
- * Dice

Learning Procedure

1. Write down terms from focus or glossary on note cards.
2. Divide students into groups of five or more and provide cards to each group.
3. Have one group of five play another group of five.
4. Let students from each group roll a dice to see which group goes first or let them pick a number between one and ten (numbers have been written down and put into a box).
5. Playing begins when a person on team #1 draws a card. That person has one minute to draw a picture that will make his teammates say the correct word. If they are correct, the team receives two points. If they are wrong or can't guess the word, team #2 has a chance to guess the word. If they are right, they receive one point. This card is placed on the bottom of the stack or discarded. A player from #2 then selects a card and draws the word for his/her team.

Points can be made by guessing the drawing of their own team (two points) or by guessing the drawing of the other team (one point).

Students aren't allowed to use words, letters or symbols in drawing.

WATER WISE FACTS MATCH

Subject: Science, Reading
Teaching Time: One Class Period
Focus: Sewage, Marine, Mammals, Seals, Pollutants

Student Activity # 21

Curriculum Objective: Identify at least three animals that live in water and at least three animals that live on land. Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Consumer Science: Environmental problems.

Learning Objective: The student may correctly match the water pollution fact to the matching picture.

Teacher Tip

The teacher may read the facts to the students. Discuss the facts orally with students. Discuss the meaning of vocabulary. Display pictures of marine animals, such as dolphins, seals, whales, etc.

Materials

- * Pencil
- * Mimeographed facts and pictures

Sample Questions

1. Why is water important?
2. Why should we care about keeping water clean?
3. What is water pollution?

Learning Procedure

1. Directions: Match the fact to the correct picture. Place the letter in the correct box.

Facts

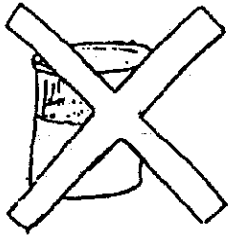
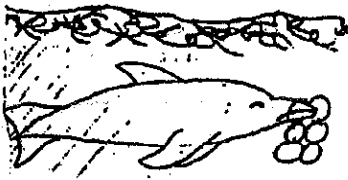
- A. A small leak can waste too much water. A leak that fills a small cup in 10 minutes will waste about 3,000 gallons of water a year.
- B. Most of the water in the world is not drinkable. Two-thirds of the water is undrinkable salt water.
- C. Americans dump 16 tons of sewage into their waters every minute of every day.
- D. Each year, one million sea birds, 100,000 marine mammals and 50,000 fur seals are killed as the result of eating or being strangled by plastic.
- E. Of a typical household, 84 percent, including food scraps, yard waste, paper, cans and bottles can be recycled.
- F. Rainwater and melted snow runs off parking lots, roof tops, streets and farms carrying pollutants into rivers and streams.
- G. For evaluation, the teacher checks the completed page.

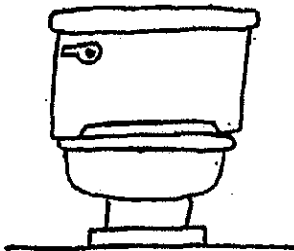
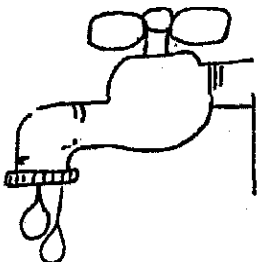
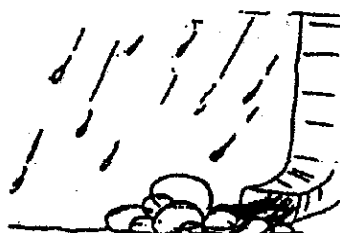
Resources

Going Green by John Eeklington, Julia Hailes, Douglas Hill and Joes Makower.

Author: Nancy Granholm

WATER WISE FACTS MATCH


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Directions: Match the fact to the correct picture. Place the letter in the correct box.

A. A small leak can waste too much water. A leak that fills a small cup in 10 minutes will waste about 3,000 gallons of water a year.

B. Most of the water in the world is not drinkable. Two-thirds of the water is undrinkable salt water.

C. Rainwater and melted snow run off parking lots, rooftops, streets, and farms carrying pollutants into rivers and streams.

D. Each year, one million sea birds, 100,000 marine mammals and 50,000 fur seals are killed as the result of eating or being strangled by plastic.

E. Eight-four percent of a typical household's waste – including food scraps, yard waste, paper, cans and bottles can be recycled.

F. Americans dump 16 tons of sewage into their waters every minute of every day.

DOWN THE DRAIN

Subject: Science, Art, Social Studies
Teaching Time: One Class Period
Focus: Run off, Groundwater, Surface Water,
Nonpoint Source Pollution, Urban

Student Activity # 22

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Environmental Problems-Consumer Science

Learning Objective: The students will identify Nonpoint Sources of Pollution found in street run-offs.

Teacher Tip

Mix the drawings and pass them out to students. Each student explains the Nonpoint Source Pollution in the drawing. The illustrator of the drawing lets the group know if their drawing was explained correctly. If not, the illustrator explains. Social Studies books may be used because there are many pictures of American cities in them.

Teacher Background

Water run-off from neighborhood streets can carry waste, oil, household chemicals, fertilizers, pesticides, pet wastes and pollution from faulty septic tanks into lakes and streams.

Materials

- * Poster paper
- * Construction paper
- * Markers
- * Pictures of cities

Sample Questions

1. How does water become polluted in a city?
2. How does rainwater on asphalt streets become polluted?
3. Where does rainwater eventually go?

Learning Procedure

1. Ask each student to select a city anywhere in the United States. Allow them to sketch a poster picture of the buildings, forms of transportation or various rivers or streams found in their selected city.
2. Display these posters throughout the room.
3. Ask students to name ways rainwater might become polluted in these cities.
4. Teacher should direct student's attention to the various components used in the make-up of streets. (Asphalt-concrete) Remind students what happens when water drains off of streets into storm drains. (Oil and petroleum from vehicles and trash from people)
5. For evaluation, have students choose a poster other than their own and have them identify at least one Nonpoint Source of Pollution.

Resources

Various encyclopedias and library books on cities in the United States, Department of Environmental Quality. EPA Journal, Nov./Dec., 1991 Vol. 17 22K-1005.

Author: Shanell Grayson

YOU'RE ALL WET

Subject: English, Writing
Teaching Time: One Class Period
Focus: Water, Wet, Drip, Flow,
Nonpoint Source Pollution

Student Activity # 23

Curriculum Objective: Environmental Problems in Consumer Science

Learning Objective: The student will brainstorm water cliches and them illustrate. The student will write and illustrate a story with water as the main character.

Teacher Tip

Use after instruction of types of Nonpoint Source Pollution.

Materials

- * Paper
- * Pencil
- * Construction paper
- * Markers
- * Butcher paper
- * Paint

Sample Questions:

1. What is Nonpoint Source Pollution?
2. What causes water pollution?
3. Name ways we can help clean up our lakes and streams.

Learning Procedure

1. Group time: Discuss how water is used in language such as cliches and symbolism. (Ex. "wet behind the ears," "all washed up") Brainstorm other cliches and symbols of water.
2. Have each child illustrate a water cliche or symbols.
3. Cooperative group activity - Divide the class into groups. Have each group write a story with water as the main character. In the story the water character must come in contact with one of the nonpoint pollution problems. Tell how the water character solves the problem.
4. Each group illustrates their story. This may be used for a bulletin board.

Supplemental Activities

1. Set up a water cliche center.

Resources

"Earth Notes," United States Environmental Protection Agency, 22K-1001, Fall, 1991.

Author: Cathy Butler

HOW'S THE WATER?

Subject: Science

Teaching Time: Two Class Periods

Focus: Crustaceans, Stonefly, Caddisfly, Water Penny, Riffle Beetle, Mayfly, Gilled Snail, Dobsonfly, Crayfish, Sowbug, Scud, Alderfly Larva, Fishfly Larva, Damselfly, Watersnipe Fly Larva, Crane Fly, Beetle Larva, Dragonfly, Clam, Aquatic Worm, Midge Fly Larva, Blacdiy Larva, Leech, Pouch Snail

Student Activity # 24

Curriculum Objective: Identify at least three animals that live in the water and at least three animals that live on land. Identify the interdependence of organisms in food chains, food webs, and energy pyramids. Know characteristics of the major classification groups: monera, protist, fungi, plant and animal kingdoms.

Learning Objective: Students will examine water samples to evaluate water quality.

Teacher Tip

A small ice pack in a cooler will help the water samples survive. Organisms can live up to two days in a sealed plastic bag if conditions are right.

Teacher Background:

Conducting a stream quality survey can help you determine how clean a stream is. Counting and identifying insects in a stream can help you answer this question.

Insects absence or presence can serve as indicators of environmental conditions.

Macroinvertebrates (visible spineless animals) are easy to find.

Materials

- * Water samples of various places
- * Old screen mesh, or dip net
- * Pans
- * Tweezers
- * Magnifying glass
- * Plastic bags (that can be sealed and re-sealed)
- * Stream Insects and crustaceans chart

Sample Questions

1. What is water quality?
2. How does water quality affect insects that live in the water?

Learning Procedure

1. Display transparency of stream insects and crustaceans. Point out organisms that live in different types of water quality. Discuss likeness and difference of each organism.
2. Divide students in groups and have students choose an organism to study. Have them make an oral presentation of the likeness and difference of their chosen organism compared to at least three other organisms on the handout.
3. After students become familiar with the organisms, the transparency can be used to categorize them into the different water types that are their habitats. To reinforce, prepare various cut out pictures from the handout and distribute to students.
4. Using the identification transparency, the student will name the organism and state the type of water quality it can live in.
5. A day in advance, collect water samples from nearby streams, ponds, rivers. Put samples in sealed bags. Divide students in small groups. Provide a pan for each group.
6. Pour water samples into pans. Let students look for organisms and evaluate the quality of the water.
7. Given three different water samples, students will observe organisms and determine the quality of the water.

Resources:

Water Quality Indicators Guide: Surface Waters, U.S. Department of Agriculture, Soil Conservation Service SCS-TP-161 (1988) Save Our Stream Program, Izzac Walton League of America 1401 Wilson Blvd., Level B Arlington, VA 22209.

Stream Insects & Crustaceans

GROUP ONE TAXA

Pollution sensitive organisms found in good quality water.

1 **Stonfly:** Order Plecoptera 1/2" - 1 1/2", 6 legs with hooked lips, long antennae, 2 hair-like tails.

2 **Caddisfly:** Order Trichoptera Up to 1/2", 6 hooked legs on upper third of body; 2 hooks at back end. May be in a stick, rock or leaf case with its head sticking out.

3 **Water Penny:** Order Coleoptera 1/4", flat saucer-shaped body with a raised bump on one side and 6 tiny legs on the other side.

4 **Rifle Beetle:** Order Coleoptera 1/4", oval body covered with tiny hairs, 6 legs, antennae.

5 **Mayfly:** Order Ephemeroptera 1/4" - 1", brown, moving, plate-like gills on sides of body, 6 large hooked legs, many long feelers on lower half of body, antennae, 2 or 3 long, hair-like tails.

6 **Gilled Snail:** Phylum Mollusca Shell opens on right, opening covered by thin plate called operculum.

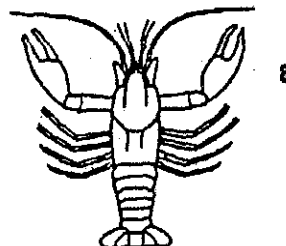
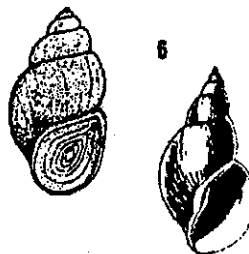
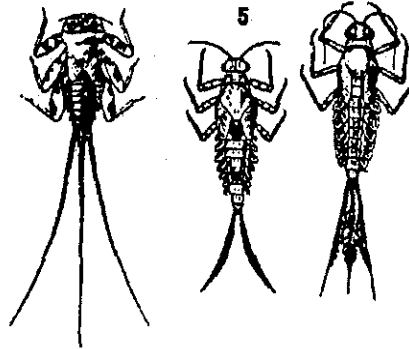
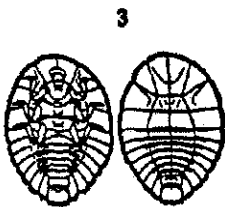
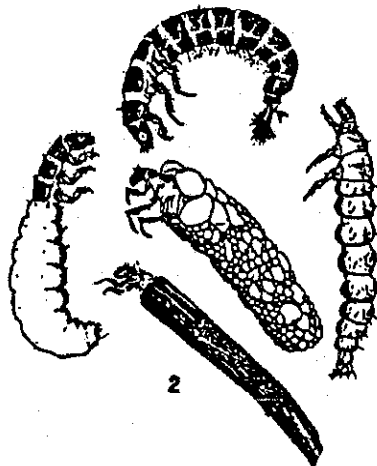
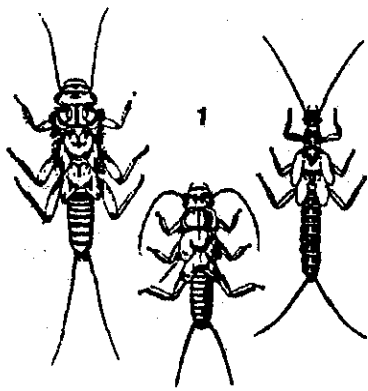
7 **Dobsonfly (Hellgrammite):** Suborder Megaloptera 3/4" - 4", dark-colored, 6 legs, many long feelers on lower half of body, short antennae, 4 hooks at back end.

GROUP TWO TAXA

Somewhat pollution tolerant organisms can be in fair quality water.

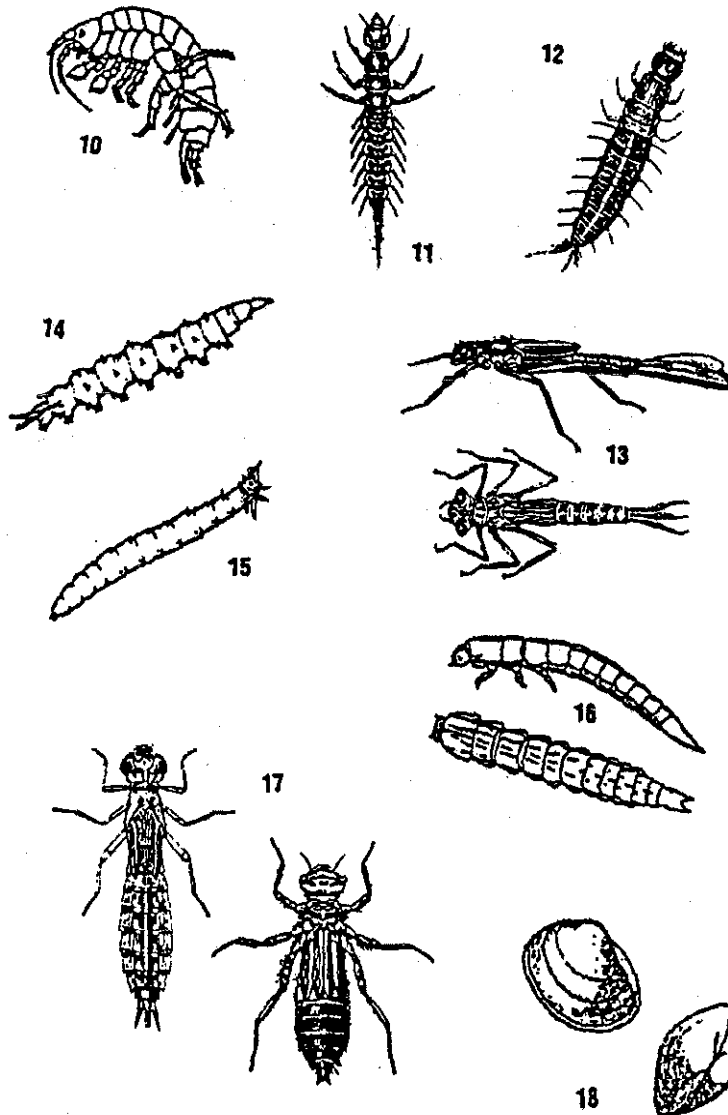
8 **Crayfish:** Order Crustacea 1/2" - 6", 2 large claws, 8 legs, resembles small lobster.

9 **Sowbug:** Order Crustacea 1/4 - 3/4", gray oblong body wider than it is high, more than 6 legs, antennae.



HOW'S THE WATER?

GROUP TWO TAXA continued



10 *Scud*: Order Crustacea 1/4", fat body higher than it is wide, swims sideways, more than 6 legs, resembles small shrimp.

11 *Alderfly larva*: Suborder Megaloptera 1" long. Looks like small hellgrammite but has 1 long, thin, branched tail at back end.

12 *Fishfly larva*: Suborder Megaloptera 1" - 1 1/2" long. Looks like small hellgrammite but lighter reddish-tan color, often with yellowish streaks.

13 *Damselfly*: Order Odonata 1/2" - 1", large eyes, 6 thin hooked legs, 3 broad ear-shaped tails.

14 *Watersnipe Fly Larva*: Order Diptera (*Atherix*) 1/4" - 3/4", green, tapered body, many caterpillar-like legs, conical head, feathery "horn" at back end.

15 *Crane Fly*: Order Diptera 1/3" - 2", green or brown, plump caterpillar-like segmented body, finger-like lobes at back end.

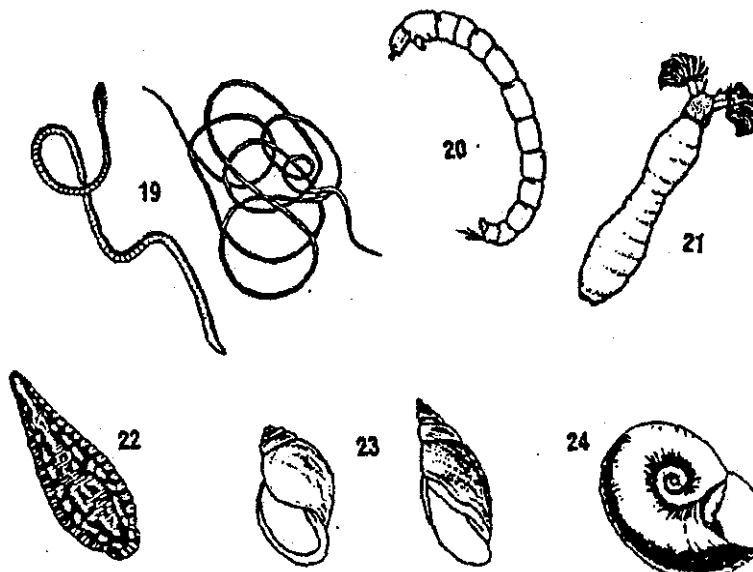
16 *Beetle Larva*: Order Coleoptera 1/4" - 1", light-colored, 6 legs on upper half of body, feelers, antennae.

17 *Dragonfly*: Order Odonata 1/2" - 2", large eyes, 6 hooked legs.

18 *Clam*: Phylum Mollusca

GROUP THREE TAXA

Pollution tolerant organisms can be in poor quality water.



19 *Aquatic Worm*: Order Oligochaeta 1/4" - 1", can be very tiny, thin worm-like body.

20 *Midge Fly Larva*: Order Diptera Up to 1/4", worm-like segmented body, 2 legs on each side.

21 *Blackfly Larva*: Order Diptera Up to 1/4", one end of body wider. Black head, suction pad on end.

22 *Leech*: Order Hirudinea 1/4" - 2", brown, slimy body, ends with suction pads.

23 *Pouch Snail*: Phylum Mollusca Shell opens on left. No operculum. Breath air.

24 *Other snails*

POLLUTION SOLUTION CINQUAIN

Subject: Creative Writing
Teaching Time: One Class Period
Focus: Nutrients, Ground Water, Agriculture, Pollutant, Landfill, Ecology, Bacteria, Waste, Sediment, Water

Student Activity # 25

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Consumer Science-Environmental Problems.

Learning Objective: Students will be able to correctly write a cinquain on the topic of Nonpoint Source Pollution.

Teacher Tip

Younger classes may do joint cinquains.

A cinquain is a five line stanza. For students in grades K-1 say the words and write responses on the board.

Teacher Background

Cinquain is derived from the French and Spanish words for five. This form of poetry is also based on syllables or may be based on numbers of words. The parts are 1) the title in two syllables, 2) a description of the title in four syllables (or words), 3) a description of a feeling in eight syllables (or words); and 5) another word for the title in two syllables (or words).

Materials

- * Mimeographed guide to write cinquain
- * Pencils

Sample Questions

1. Ask the student if they were a fish, how would they feel if they had to live in a muddy, polluted stream.
2. Have students describe how they feel when they see trash floating in a stream or oil floating on top of water in a stream.

Learning Procedure

1. Have students define vocabulary.
2. The student is given a mimeographed form to follow.
3. Guide younger students in understanding describing, action and feeling words.
4. Compile all poems in a booklet to place in a nature center or display on bulletin board.

Resources

"Oh, Give Me a Home!" video accompanying this education package. The Lorax, Dr. Seuss.

Author: Nancy Granholm

POLLUTION SOLUTION CINQUAIN

Pollution Solution Cinquain

(Title)

(words that describe title)

(action words describing title)

(four feeling words in a phrase)

(rename title)

example Pesticide (title)
poisonous deadly (describing title)
destroying polluting oozing (action words)
the enemy of water (four feeling words)
Killer (rename title)

Examples for titles: nutrients, ground water, agriculture,
pollutant, landfill, ecology, bacteria, waste, sediment, water

AWAY WE GO . . .

Subject: English, Science, Social Studies
Teaching Time: One Class Period, Field Trip or
Student observes on own time.
Focus: Sedimentation, Run off, Mulching,
Erosion, Topsoil

Student Activity # 26

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and it's effect on living things. Consumer Science: Environmental Problems

Learning Objective: To make students observe and learn how construction sites add to Nonpoint Source Pollution problems.

Teacher Tip

This lesson could be used as a science project idea.

Teacher Background

Contact your local Soil and Water Conservation District office or Soil Conservation Office for resource assistance.

Materials

- * Available construction site (house or business) that is taking place or will soon take place
- * notebook for documenting evidence

Sample Questions

1. What is erosion?
2. What causes erosion?
3. What methods can you take to prevent erosion on a construction site?

Learning Procedure

1. Take students to a proposed construction site. An example might be a subdivision or a commercial piece of property that will soon undergo development.
2. Have students record trees, wildlife, and vegetation that they find. Note: Make students aware of the entire environment.
3. Let students dig in the soil to study soil colors, insects or have them measure topsoil depth.
4. Have students record all findings.

5. After construction has begun, visit the site again.

Ask the following questions?

- What changes have taken place in the area?
 - What has happened to the trees, wildlife and soil?
 - During construction what happens to the soil when it rains?
 - Where does the water run off go?
 - Are there any lakes or streams below the site?
 - Can you see any evidence of Nonpoint Source Pollution in these lakes or streams?
6. For evaluation have students discuss two things that could be done to prevent soil run off during and after construction.
7. May use photos to document changes to the site and for making a poster.

Supplemental Activities

1. Visit sites after heavy rains if possible, and collect water samples from ditches, etc.
2. Contact county permit offices to determine ordinances required for builders to obtain concerning conservation practices.

Resources

USDA Soil Conservation Service, "Land Use Planners: Soil Surveys Can Help You," (1990);
Department of Environmental Quality, Mississippi Soil & Water Conservation Commission.

Author: Lynn Porter

POLLUTION SUPERHERO

Subject: Whole Language (All areas)
Teaching Time: One Class Period
Focus: Superhero, Planet, Conservation, Pollution, Water

Student Activity # 27

Curriculum Objective: Consumer Science: Environmental Problems

Learning Objective: Students will illustrate qualities that a superhero must have to fight water pollution.

Teacher Tip

This lesson could be used to follow instruction on water quality and pollution.

Teacher Background

Collect comic strips from various sources for students to use.

Materials

- * Drawing paper
- * Markers
- * Sheet music to Ghostbusters or Captain Planet

Sample Questions

1. What characteristics do superheroes have?
2. How do they fight crime and evil?
3. How can you be a superhero in the fight against water pollution?

Learning Procedure

1. Divide the class into cooperative groups.

Each group should:

- develop a water pollution superhero
- illustrate their hero
- write a comic strip featuring the superhero
- write song lyrics (they may use the tune from Ghostbusters or Captain Planet)
- make a symbol or slogan
- decide how the superhero helps the water pollution problem
- creative writing: Walter Water saves the day.....

2. For evaluation, the superhero must illustrate qualities that reflect the fight against water pollution. Lyrics to song must include the five vocabulary words. Symbol and slogan must reflect properties concerning water pollution.

Resources

Water In Your Hand, Soil and Water Conservation Society, 1990.
SWCS, 7515 N.E. Ankenny Rd., Ankenny, Iowa 50021-9764 or
call 1-800-THE SOIL.

Author: Cathy Butler

NONPOINT KNOWLEDGE!

Subject: Math, Science
Teaching Time: One Class Period
Focus: Nonpoint Source Pollution

Student Activity # 28

Curriculum Objective

Identify positive and negative aspects of man's impact on the environment and its effect on living things.
Consumer Science: Environmental Problems

Learning Objectivity

Students will determine level of knowledge about Nonpoint Source Pollution.

Teacher Tip

After discussing Nonpoint Source Pollution and the causes, have students make up their own questionnaire.

Teacher Background

For more information, contact EPA Atlanta, Ga. (See References)

Materials

- * Questionnaire
- * Pencil

Sample Questions

1. What is Nonpoint Source Pollution?
2. Name three pollutants that contribute to Nonpoint Source Pollution.
3. What can we do about this type of water pollution?

Learning Procedure

1. Students will develop a questionnaire and survey parents and adults in their community to determine knowledge level about Nonpoint Source Pollution.
2. Students will graph results using bar, circular or line graphs.
3. Calculate percentage of knowledgeable and unknowledgeable results.
4. Total classroom results for overall graph.

Supplemental Activities

1. Students could survey other students outside of their immediate class.

SAMPLE QUESTIONNAIRE NONPOINT SOURCE POLLUTION

1. Name 3 sources of Nonpoint Source Pollution?
2. How can animal waste harm humans?
3. How do trees prevent pollution?
4. Name two ways urban stormwater run-off contributes to this type of water pollution?

Resources

Bulletin, "Polluted" United States Environmental Protection Agency, Office of Water, Washington, DC 20460, 1990. For more information contact: Region IV EPA, 345 Courtland Street, NE Atlanta, Ga 30365 Phone 404/347-2126.

Author: Erica Graham, Judy Martin, Beverly Richardson

IN PURSUIT OF NONPOINT SOURCE POLLUTION

Subject: Science, Language Arts, Reading
Teaching Time: Two Class Periods
Focus: Nonpoint Source Pollution, point source pollution, run-off, sediment, erosion

Student Activity # 29

Curriculum Objective

Consumer Science: Environmental Problems

Learning Objective

Students will name sources of Nonpoint Source Pollution and identify the extent of these water quality problems.

Teacher Tip

This game is similar to Trivial Pursuit.

Teacher Background

EPA brochure, "Polluted." (See Resources)

Materials

- * 3/5 index cards
- * Trivial Pursuit board game or make one with poster board
- * Video, "Oh, Give Me a Home!"
- * Nonpoint Source Pollution reference materials

Learning Procedure

1. Divide students into two groups. Preview the video included in this package, "Oh, Give Me a Home!"
2. Provide reference materials for students to use.
3. Have students make up questions and answers from materials provided.
4. During the next class period, let students play "In Pursuit of Nonpoint Source Pollution."

Supplemental Activities

1. Students could use a different board game with questions such as Aggravation or Pictionary.

SAMPLE QUESTIONS AND ANSWERS FOR "IN PURSUIT OF NONPOINT SOURCE POLLUTION"

1. Name one way agriculture cause Nonpoint Source Pollution problems? (soil erosion) (chemicals) (animal waste)
2. Overusing _____ to make your grass grow green can cause Nonpoint Source Pollution. (fertilizer)

3. Why is Nonpoint Source Pollution called Nonpoint Source Pollution? (Because it's hard to identify where it comes from—it comes from indirect sources)

4. Name one way to prevent soil erosion. (plant grass)

5. _____ or dispose of used oil, anti-freeze, paints or other household chemicals properly. (recycle)

6. Pollutants reaching our waters get into the food chain and harm _____ life. (aquatic)

7. Aquatic means _____. (living or growing in the water)

8. Name one type of aquatic animal. (fish) (turtle)

9. Water covers how much of the earth? $\frac{3}{4}$ $\frac{1}{2}$ $\frac{1}{4}$ ($\frac{3}{4}$)

10. Water moves from clouds to land and back to the ocean in a never-ending cycle. Name this cycle. (the water cycle)

11. Muddy water, excess plant growth, dead fish, stained water or soil, oily or foul-smelling water can indicate that a stream is polluted or non-polluted? (polluted)

12. Recycling a 3 foot stack of newspapers will save one, two or threetrees? (one)

13. The average person per day uses 22,000 gallons, 10 gallons or 2,000 gallons of water? (2,000) Note: Most of this water is used for industry and agriculture.

14. True or False Litter can be life-threatening to wildlife. (True) Note: Fish, birds and other animals can become entangled in plastic nets, line and six-pack rings.

15. True or False When someone dumps dirty oil on the ground, it can seep into ground water. (True)

Resources

Environmental Protection Agency, Region IV, 345 Courtland Street, N.E. Atlanta, Ga 30365
Phone 404/347-2126.

WASTE A WAY

Subject: Science
Teaching Time: One Class Period
Focus: Fill Line, Percolation, Scum, Sludge, Septage, Aerobic Bacteria, Anaerobic Bacteria,

Student Activity # 30

Curriculum Objective

Identify the positive and negative aspects of man's impact on the environment and its effect on living things.
Consumer Science: Environmental Problems and Soil Chemistry.

Learning Objective

To make students aware of how a septic tank operates.

Teacher Tip

*This lesson could be used after the different types of Nonpoint Source Pollution have been discussed.
Possible science fair idea.*

Teacher Background

Over one-fourth of the homes in the United States are not connected to wastewater treatment plants. Many of these homes dispose of their waste by using their own disposal system, called a septic tank. Septic tanks discharge billions of gallons of wastewater into the soil each year. It is very important that a septic operates correctly or it can pollute surface and ground water.

Materials

* Septic Tank diagram

Sample Questions

1. What role does bacteria play in a septic tank?
2. What is percolation?
3. Why does a septic tank need to operate properly?

Learning Procedure

1. Describe how a septic tank works using the attached diagram.
2. Discuss potential problems with septic tanks their causes and solution.
 - chemicals dumped into the water supply that kill bacteria that remove the wastes from the sewage water.
 - soil with a high clay content that doesn't allow percolation of the water, this leads to flooding.
 - when septage is not pumped out of the tank every few years there may be overflows of solids into the soil or cause backup into homes.
3. For evaluation, have students label the diagram of a septic system and define scum, aerobic bacteria, anaerobic bacteria, sludge, septage, fill line and percolation.

Supplemental Activities

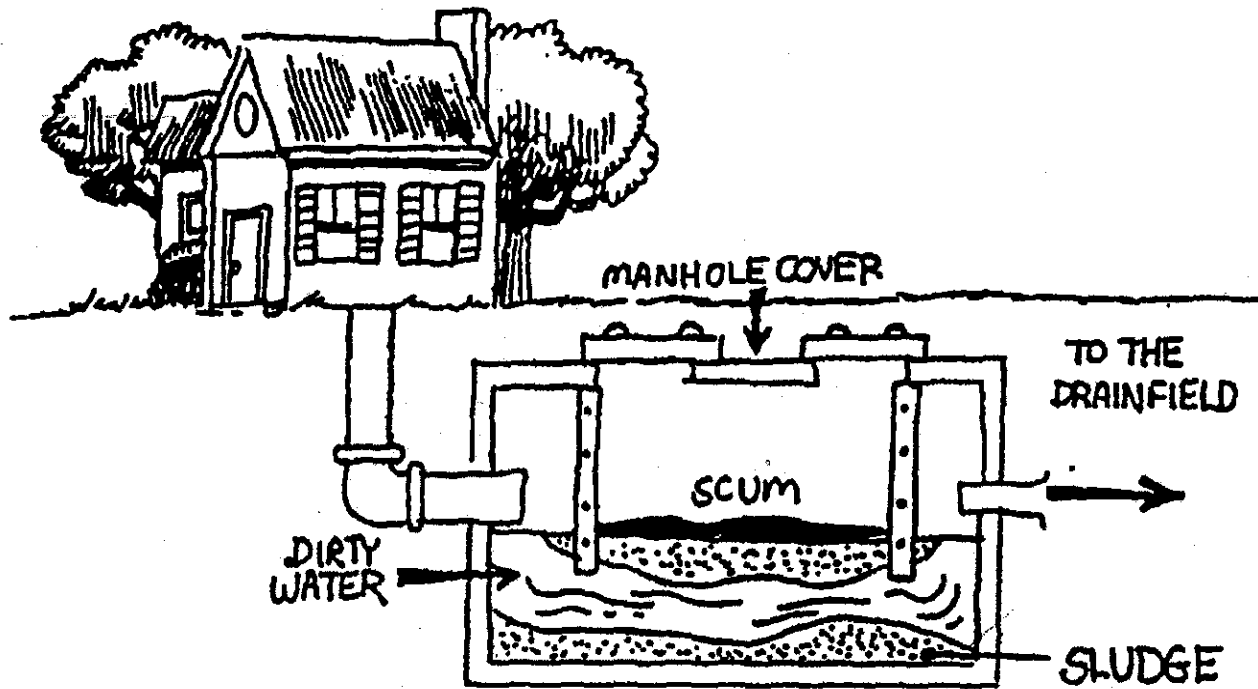
1. Locate a soil survey book for your county from your local Soil Conservation Service office. Have students determine soil type where school is located.
2. Look for recommendations in survey book on a septic tank system for this soil.

Resources

Mississippi Department of Environmental Quality,
Mississippi State Department of Health, "Be Water Wise,"
U.S. Army Corps of Engineers, Vicksburg District.

Author: Michael Newman

WASTE A WAY



YOUR MISSION - NONPOINT SOURCE POLLUTION

Subject: Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation (Bloom's Taxonomy)
Teaching Time: Several Class Periods
Focus: Agriculture, Construction, Silviculture, Urban Storm Run-off, Surface Mining, Land Disposal, Hydrologic Modification, Landfills, Underground Storage Tanks

Student Activity # 31

Curriculum Objective

Identify the positive and negative aspects of man's impact on the environment and its effect on living things.
Consumer Science: Environmental Problems

Learning Objective

Using higher level thinking skills, students will develop a better understanding of Nonpoint Source Pollution.

Nonpoint Source Pollution is pollution from diffuse sources, usually associated with rainfall run-off moving over and through the ground and carrying natural and man-made pollutants into lakes, rivers and streams, wetlands, estuaries, coastal waters, and ground water.

Various land use activities cause Nonpoint Source Pollution problems. They are:

1. Agriculture - field crop erosion, farm chemicals (pesticides, fertilizers, etc.) animal waste (nutrients and bacteria) from feed lots, chicken houses, etc.
2. Construction - sediment from land clearing
3. Silviculture (timber harvesting and management) - sediment from land clearing
4. Urban Storm Run-off - from city streets, parking lots, and industrial lots, carries oil, gas, antifreeze, and other pollutants
5. Surface Mining - of dirt, gravel, or minerals, can produce large amounts of sediment-laden run-off
6. Land Disposal (septic tank disposal systems) - bacteria and nutrients
7. Hydrologic modification - alters the path of run-off water resulting in increased erosion
8. Landfills - pollution seeps into ground water and surface water
9. Underground Storage Tanks - when a tank leaks, gasoline, oil and other chemicals seep into ground water.

Best Management Practices (BMPs) are the most practical, effective and economical means of preventing pollution from nonpoint sources (NPS) or reducing pollution to a level that is compatible with water quality goals. (BMPs) may include the use of natural structures such as trees, grass, or wetlands; or they may be agricultural techniques such as conservation tillage, and temporary or permanent erosion control structures such as silt fences, hay bale dikes, sedimentation ponds, or terraces.

Nonpoint Source Pollution (NPS), or pollution from indirect sources, impairs water quality in 60 to 70 percent of waterbodies in Mississippi today. In 1987, Section 319 of the Clean Water Act instructed states to address NPS Pollution problems.

Materials

- * Newspaper
- * Brochure from Mississippi Department of Environmental Quality or Fact Sheet. (Included in lesson plan package)

Sample Questions

1. Define Nonpoint Source Pollution.
2. Define Point Source Pollution.
3. How could a landfill contribute to Nonpoint Source Pollution?

Learning Procedure

1. Knowledge: Identify the nine various land use activities which cause Nonpoint Source Pollution problems.
2. Comprehension: Choose one area of NPS pollution and explain its impact on humans.
3. Application: Take a local newspaper and find articles that are associated with NPS pollution.
4. Analysis: Research the local landfill and analyze the potential problems created by it. Create a poster of the results.
5. Synthesis: Design and illustrate a brochure which represents the nine areas of NPS pollution. Distribute to parents and friends.
6. Evaluation: Determine the most critical NPS pollution in your particular area and create a plan that would reduce NPS pollution. Produce fact sheets of information gathered from local sources.

Supplemental Activities

1. Have students write and produce public service announcements for TV or radio using camcorder or tape recorder. Let students take roles of interviewer and one developer that practices NPS pollution control and one that does not.

Resources

The name of the brochure will be: "Nonpoint Source Pollution, Problems and Solutions," Mississippi Department of Environmental Quality, Miss. Dept. of Environmental Quality, Office of Pollution Control, Water Quality Branch, P.O. Box 10385, Jackson, MS 39289-0385 (601) 961-5171



HELP KEEP MISSISSIPPI'S WATERS CLEAN

PREVENT NONPOINT SOURCE POLLUTION

NONPOINT SOURCE POLLUTION is pollution from many different sources, usually associated with rainfall runoff moving over and through the ground, carrying natural and man-made pollutants into lakes, rivers, streams, wetlands, estuaries, coastal waters, and underground drinking water.

Various land use activities cause nonpoint source pollution problems. They are:

1. **Agriculture** soil erosion, farm chemicals, fertilizers, and animal waste.
2. **Construction** sediment from land clearing and grading activities.
3. **Forestry** timber harvesting activities, such as sediment, woody debris, and logging roads.
4. **Urban Storm Runoff** automobile waste substances such as oil, gas, antifreeze, and other pollutants carried from city streets, parking lots, and industrial lots.
5. **Surface Mining** of dirt, gravel, or minerals, can produce large amounts of sediment-laden runoff.
6. **Land Disposal** (septic tank disposal systems) - bacteria and nutrients
7. **Hydrologic modification**... the path of water is altered, soil erosion may increase.

BEST MANAGEMENT PRACTICES FOR NONPOINT SOURCE POLLUTION

Best Management Practices (BMPs) are the most practical, effective and economical means of preventing pollution from nonpoint sources (NPS) or reducing pollution to a level that is compatible with water quality goals.

Natural BMPs

Tree buffer zone
Grass filter strips
Wetlands

Man-made BMPs

Conservation tillage	Terracing, contour planting
Straw bale dikes	Constructed wetlands

YOUR MISSION - NONPOINT SOURCE POLLUTION

WHAT YOU CAN DO TO REDUCE NONPOINT SOURCE POLLUTION

Nonpoint Source Pollution (NPS), or pollution from indirect sources, impairs water quality in 60 to 70% of water bodies in Mississippi today. In 1987, Section 319 of the Clean Water Act instructed states to address NPS pollution problems.

WHAT HOMEOWNERS, GARDENERS, AND LANDSCAPERS CAN DO

- Plant trees, shrubs and groundcovers to filter out pollutants and dramatically reduce the amount of runoff generated.
- Recycle or dispose of used oil, antifreeze, paints and other household chemicals properly, not in storm sewers or drains. If your community does not have a program for collecting household hazardous wastes, ask your local government to establish one.
- Encourage local government officials to develop construction erosion/sediment control ordinances in your community.
- Follow manufacturers' directions when using fertilizers and pesticides.
- Compost grass and leaves, if possible. Grass clippings and leaves raked into the street will wash into storm sewers and into the nearest river or lake.
- Maintain your septic tank and fill line, and pump out solids periodically.
- Rural homeowners should protect private wells by keeping chemicals away from the well head and by placing the septic tank and fill line downhill from the well.
- Participate in the "Adopt A Stream Program" in your community.

WHAT FARMERS CAN DO

- Prevent erosion because it not only costs you money and land, it also pollutes the water.
- Use a wide variety of soil and water conservation practices such as no till or minimum till farming, terracing, crop rotation, contour planting, and irrigation tailwater recovery.
- Keep livestock out of streams where their wastes can pollute the water and their movements can cause erosion.
- If utilizing animal wastes or compost for fertilizer, apply at acceptable rates.
- Water used to wash out animal confinement areas should not be allowed to enter waters of the state. Facilities for the treatment or disposal of wastewater generated at animal confinements should seek a permit from the Mississippi Department of Environmental Quality.
- Dead animals should be disposed of in an approved manner. Composting is preferred to burial for small animals such as chickens.
- Apply chemicals at the proper rate and not when rainfall is imminent. Dispose of pesticides, containers, and tank rinse water in an approved manner. Encourage a pesticide container recycling program in your county.
- Plug unused wells and cap artesian wells.
- Leave trees and shrubs along streams and other water bodies to control erosion and to filter pollutants.

- Use proper logging and erosion control practices on your forest lands by ensuring proper construction, maintenance and closure of logging roads. Retain trees and shrubs on the edges of drainage channels, streams, and rivers.
- Recycle waste oil generated in farm use.

WHAT CIVIC LEADERS CAN DO

- Sponsor a tour to identify potential causes of NPS pollution in your community and to illustrate the application of BMPs.
- Sponsor an amnesty day and allow people to bring in old paint, chemicals, oil, and other chemical wastes for proper disposal.
- Publicly encourage other civic, environmental, business and governmental groups to join you in sponsoring sound preventive measures.
- Encourage local government officials to develop construction erosion/sediment control ordinances in your community.

WHAT LAND DEVELOPERS AND CONTRACTORS CAN DO

The new Federal Storm Water Regulations require erosion and sediment controls for construction sites of five acres or more. For a permit, call (601)961-5171 or write:

Industrial Wastewater Branch, Stormwater Section
Mississippi Department of Environmental Quality
P. O. Box 10385
Jackson, Mississippi 39289-0385

- Before clearing a site, install sediment controls such as silt fences, hay bales, or sediment basins.
- Minimize disturbance of trees and vegetation. It is especially important to retain natural vegetation around creeks and drainage areas.
- Correct erosion problems immediately.
- Maintain the natural drainage of the site to the fullest extent possible.
- Do not channel concentrated runoff flows into natural creeks or gullies.
- Design drainage systems to maximize infiltration into the soil and minimize concentrated flows which may require curbs and gutters.

For information, call (601)961-5171 or write:

Mississippi Department of Environmental Quality
Office of Pollution Control
Water Quality Management Branch
P.O. Box 10385
Jackson, Mississippi 39289-0385

(school's name) POLLUTION SOLUTION

Subject: Whole Learning

Teaching Time: One Class Period

Focus: Nutrients, Ground Water, Agriculture, Pollutant, Landfill, Pesticide, Waste, Sediment, Ecology, Bacteria

Projects/Extended Activity # 32

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Consumer Science: Environmental Problems.

Learning Objective: Students will be able to understand and identify problems and solution concerning Nonpoint Source Pollution.

Teacher Tip

Excellent for the teacher looking for a class project activity example: honors, enrichment classes. You could use other word search puzzles included in this packet to accompany this lesson plan.

Teacher Background

Use "Water In Your Hands," comic book as teaching aid. (See Resources)

Materials

- Computer (optional)
- White construction paper
- Black felt pens
- Tape
- Scissors
- Access to newspapers and appropriate periodicals

Sample Questions

1. What is Nonpoint Source Pollution?
2. What is Point Source Pollution?
3. What are ways we can prevent water pollution?

Learning Procedure

Have students construct a newspaper about solutions to water pollution. Sections of the newspaper could include:

- Headline News - articles about water pollution from newspapers, magazines, pamphlets, etc.
- Sports - activities involving water
- Want Ads - volunteers, Needed: Clean water
- Advertisements - student inventions, water treatment systems, septic tanks.
- Comic Strips - create own comic characters (ex. Mr. Water Quality)
- Obituaries - fish kills, streams, wildlife
- Letters to the Editor - "Dear Polly Pollution"- advice on pollution problems, comments

Supplemental Activities

1. Include word scramble
2. Include word search
3. Distribute newspaper to other classes and to parents.
4. Take a field trip to a local newspaper office

Resources

"Water Riches," Mississippi Cooperative Extension Service, Mississippi State University. (Available from your local county extension agent). "Water In Your Hands," Soil and Water Conservation Society, SWCS 7515 N.E. Ankeny Road, Ankeny, Iowa 50021-9764. or call 1-800-The Soil.

Author: Cathy Butler and Nancy Granholm

WAT-ER IMPRESSION!

Subject: Science
Teaching Time: Several Class Periods
Focus: Point, Nonpoint Source Pollution

Project/Extended Activity # 33

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and its effect on living things.

Learning Objective: To make others in the community aware of information learned in preceding units relating to water pollution.

Teacher Tip

It is recommended that this activity be used after students have ample knowledge of information on Nonpoint Source Pollution.

Teacher Background

A Conservation Awareness day can be planned with the help of many conservation agencies and organizations such as USDA Soil Conservation Service, Mississippi Soil & Water Conservation Commission, Mississippi Department of Environmental Quality, USDA Forest Service, Mississippi Forestry Commission, Farm Bureau, Mississippi Museum of Natural Science, Extension Service, Agricultural Stabilization and Conservation Service, Mississippi Wildlife Federation and more. Resource persons are available from these agencies to assist in planning and implementing an "Awareness Day" in various conservation fields.

Materials

- * Aquifer water model (available from Department of Environmental Quality)
- * Model conservation farm (available from Mississippi Soil and Water Conservation Commission)
- * Various puzzles, word searches and other materials students have developed during study on Nonpoint Source Pollution study.

Sample Questions

1. What is an Awareness Day?
2. What steps are necessary in planning a school wide Awareness Day? (committees, etc.)
3. Who else do you want to reach besides students?

Learning Procedure

1. Students will plan an "Awareness Day" so they can share information about water pollution with other classes, parents and other community residents, including builders and contractors.
2. Students will form committees such as publicity, display, clean up, planning, etc. (for upper grade levels)
3. Each committee will plan and implement their responsibilities.
4. Decide how visual centers will be established to demonstrate the importance of clean water. These centers may include: recycling center, soil erosion demonstration (contact local Soil Conservation Service office), aquifer demonstration (Department of Environmental Quality), chemical display (fertilizers, pesticides, herbicides etc. (Mississippi Chemical Company), aquatic display (Mississippi Museum of Natural Science), resource display (bulletins, posters, resources students have developed while studying unit on Nonpoint Source Pollution).
5. Invite resource persons to share information and help with individual displays.

Supplemental Activities

1. Visit local water treatment plant.

Resources

USDA Soil Conservation Service, Mississippi Soil and Water Conservation Commission, Mississippi Department of Environmental Quality

Author: Louise Autry and Pam Himebrook

THE PAPER TREE

Subject: Science: The Environment
Teaching Time: One or Two Class Periods
Focus: Urban, Forest

Project/Extended Activity # 34

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Describe how materials are recycled in an ecosystem. Consumer Science: Environmental Problems.

Learning Objective: Students will understand that paper can be made from trees and from recycled paper. Students will understand that they can effect the environment by recycling and conserving paper. Students will understand some of the energy and environmental costs of paper production. Students will develop an awareness that trees help reduce water pollution.

Teacher Background

"Man's Best Friend, The Tree"

Mississippi Forestry Commission

* Trees are on the job 24 hours a day every day. They work for all of us to improve our environment and quality of life.

* Trees and other plants make their own food from carbon dioxide in the atmosphere, water, sunlight and a small amount of soil elements. In the process, they release oxygen for us to breathe.

* Trees help settle out, trap and hold particulate pollutants. Particulates are trapped and filtered by leaves, stems and twigs.

* Trees create organic matter on the soil surface from their leaf litter.

* Trees reduce surface run-off of water from storms. Their roots increase soil permeability slowing water run-off and trapping sediment. This decreases the amount of soil erosion and sedimentation of streams.

* Trees cool the air by offering shade. Cooler water temperatures increase oxygen in the water and that is good for fish and other aquatic organisms. Trees increase humidity in dry climates through evaporation of moisture (transpiration).

* Trees absorb and block noise from the urban environment.

* Trees contribute to local ecosystems providing habitats and food for birds and animals.

Materials

* Chalkboard

* Resource materials

Sample Questions

1. What is water pollution?
2. How does a tree help reduce water pollution?
3. List three products that trees give us.
4. Name three trees that grow in Mississippi?

Learning Procedure

1. Hold up a sheet of paper or display the class trash can. Ask students what raw material is used to produce paper. (trees)
Fact: Did you know? According to the American Forest Council in Washington, DC, you could produce from one cord of wood that measures 8 feet long, 4 feet wide, and 4 feet high, the following:

* 89,870 sheets of 8 1/2 X 11 inch paper

* 7,500,000 toothpicks

* 4,384,000 postage stamps

* 2,700 copies of an average daily newspaper

2. Explain that paper from trees is becoming more difficult and costly to obtain. (difficult-environmental reasons)

3. Put the following information on the board:

What goes into the solid waste stream in Mississippi?

* 526 millions pounds corrugated cardboard (boxes) 42%

* 113 million pounds old newsprint 9%

* 565 million pounds of high white office-quality paper 47%

4. Explain that school type paper is the one solid waste paper in the school. (The average American used seven trees a year in paper, wood and other products made from trees).

5. Have students brainstorm and list ways in which energy is used in making of paper (energy for logging equipment, hauling timber, manufacturing, transportation of finished paper.)

6. Discuss how cutting trees for paper affects our environment. (refer to Breathing Tree and Buffer Tree activities included in this package.)

7. Have students plan, set up and implement a recycling center for their classroom.

8. Have students list ways to conserve paper and place list in recycling center as a reminder.

9. For evaluation, students will make or create a poster or bulletin board diagramming the process from seed/seedling to paper.

Supplemental Activities

1. Have a resource person visit your class and discuss the need for recycling white paper.
2. Extend your recycling center to include your school.
3. Have your local Soil and Water Conservation District or local Forestry Commission donate trees for planting during the spring.

Resources

Department of Environmental Quality, Director of Minimum Waste Reduction, "Benefits of Urban Trees", U.S. Dept. of Agriculture, Southern Region, Mississippi Forestry Commission, USDA Forest Service, Mississippi Soil & Water Conservation Commission, American Forest Council, Washington DC.

Author: Sherry Worsham

EVERY CLOUD HAS A SILVER LINING

Subject: Creative Writing, Art
Teaching Time: Two or Three Class Periods
Focus: Pollution, Toxic, Waste

Project/Extended Activity # 35

Curriculum Objective: Recognize the water cycle. Consumer Science: Environmental Problems.

Learning Objective: To discuss the effects of pollution on rain.

Teacher Tip

Have students draw the water cycle. Discuss with students how water is polluted. Have students close their eyes and take them on an imaginary trip as a raindrop. Give students paper that has a large outlined raindrop on it. Have them write their adventure. Have students create a list of reasons they would use to persuade others that they should work hard to conserve our water supply and to keep from polluting it.

Teacher Background

For more information about the water cycle see the USDA SCS brochure, "Conservation and the Water Cycle." For kindergarten "Water and Me," activity booklet. National Association of Conservation Districts (See local Soil and Water Conservation District for more information. See References)

Materials

- * Aluminum Foil
- * String
- * Glue
- * Wire Hangers
- * Cardboard
- * Cotton

Sample Questions

1. Where does rain come from?
2. If you were a rain drop, where would you travel when it rains?
3. How does our rainwater get polluted?

Learning Procedure

1. Brainstorm about air pollution and where it comes from.
2. Discuss where rain comes from and how it is constantly being recycled in the water cycle and how it can pick up pollution as it falls.
3. Present a story starter for students to write their story about Rodney Raindrop.

..... One day a little raindrop named Rodney decided it was time for him to leave his cloud and have an adventure. He peeked out of his cloud and then closed his eyes and jumped. As he opened his eyes.....

4. Have children illustrate their stories. Have them make clouds from cardboard and cover with aluminum foil, glue on cotton.
5. Mount stories on aluminum foil clouds and hang on wire hangers (mobiles).
6. For evaluation, have students read their stories to the class.

Supplemental Activities

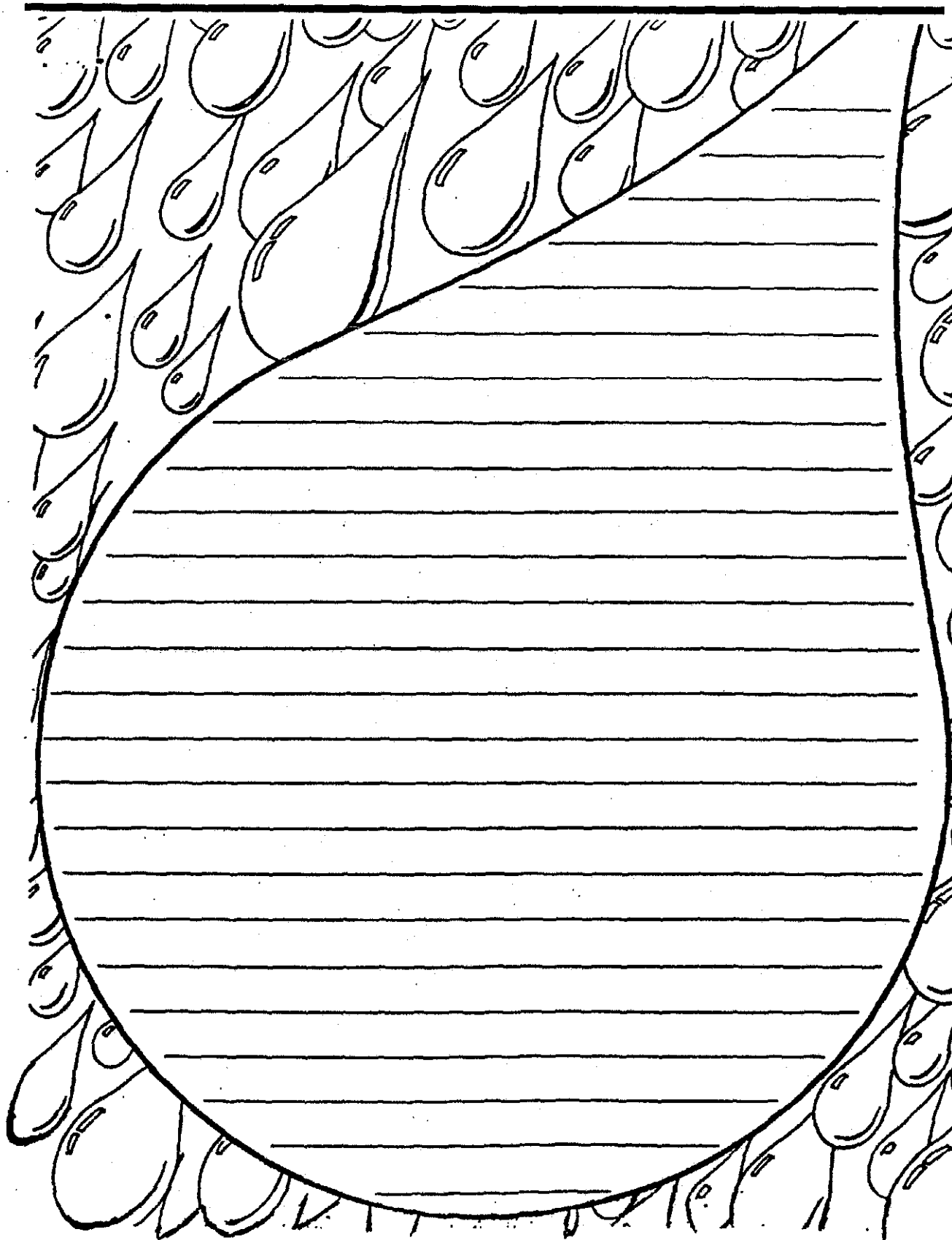
1. Let students collect rainwater in a rain gauge and measure over a period of time.
2. Have students list ways that water can become polluted in cities, subdivisions and on farms.

Resources

USDA Soil Conservation Service, National Association of Conservation Districts

Author: Pam Whitten

EVERY CLOUD HAS A SILVER LINING



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A BREATHING TREE

Subject: Science, Human Body or Plant Unit/
Extended Math Activity/Evaluation - Language
Teaching Time: One Class Period
Focus: Carbon Dioxide, Oxygen, Lungs, Photosynthesis

Project/Extended Activity # 36

Curriculum Objective

Identify parts of a plant and state their major function. Understand the functions of the respiratory system. Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Recognize the necessity of plants for the transfer of energy from the sun to all living things on earth through the process of photosynthesis.

Learning Objective

Students will understand the importance of trees to their quality of life. Students will understand how trees improve air quality.

Teacher Tip

This plan could be used after a unit on photosynthesis and the respiratory system.

Teacher Background

Trees help supply oxygen we need to breathe. Yearly each acre of young trees can produce enough oxygen to keep 18 people alive. Trees help keep our air supply fresh by using up carbon dioxide that we exhale and that factories and engines emit. Trees also use their hairy leaf surfaces to trap and filter out ash, dust and pollen particles carried in the air.

Materials

- * Poster or picture of human lungs
- * Poster or picture of leaf structure (detailed cross-cut view)

Sample Questions

1. We exhale _____ and inhale _____.
2. Trees help supply us with _____ that we need to breathe.

Learning Procedure

1. Display a picture of the human lungs. Discuss the importance of clean fresh air. Explain that when you breathe in you take in oxygen. This oxygen is used by your body. Without oxygen your body could not function. You exhale carbon dioxide and water. A typical 10 or 11 year old will breathe out about three-fourths of a kilogram of carbon dioxide daily.
2. Ask the class what happens to all the carbon dioxide in the air. Lead the discussion towards trees. Explain that through needles or leaves, trees take in carbon dioxide and use it for food.
3. Trees breathe out oxygen. (You can go into a discussion on photosynthesis and leaf structure here.) A typical tree will consume 12 kilograms of carbon dioxide per year.
4. For evaluation, students will write three complete sentences explaining the importance of trees to air quality.

Supplemental Activities

1. Math - have students calculate the number of trees it would take to consume the carbon dioxide they produce in a year.
Formula - (.75 kilograms carbon dioxide per child X 365 days in a year) divided by 12 months = 22.8 trees needed. Calculate the number of trees needed for the entire class.
2. This activity can be extended. Students can learn about the greenhouse effect and acid rain. This leads to a discussion of Nonpoint Source Pollution. The quality of our air affects the quality of our water.

Resources

"Earth Notes" U.S. Environmental Protection Agency, 401 M. Street, S.W. (A-107)
Washington, DC 20460, Fall 1991

Author: Sherry Worsham

POLLUTION SOLUTION AGENCY

Subject: Science
Teaching Time: Two Class Periods
Focus: Nonpoint Source Pollution

Project/Extended Activity # 37

Curriculum Objective

Identify the positive and negative aspects of man's impact on the environment and its effect on living things.
Consumer Science: Environmental Problems.

Learning Objective

Students will find and record sources of water pollution.

Teacher Tip

This can be done as in introduction to Nonpoint Source Pollution for awareness.

Materials

- * Student detective badge
- * Laminating material
- * Spy glass mimeographed page
- * Star stickers

Sample Questions

1. What is pollution?
2. What causes a stream, lake, river or the ocean to become polluted?
3. What types of pollution do we have in streams in Mississippi?

Learning Procedure

1. Each student is given a badge to color and cut out.
2. Assign each student a number to put on badge.
3. Laminate badge.
4. Give each student a spy glass mimeographed page.
5. The student is to discover sources of water pollution as a take home activity or as an in school activity.
6. When the discovery is made, students record the source of water pollution on the spy glass and fill in the name and number.
7. Teacher displays discoveries and awards a star sticker to put on badge.
8. For evaluation, students correctly identify water pollution problems.

Supplemental Activities

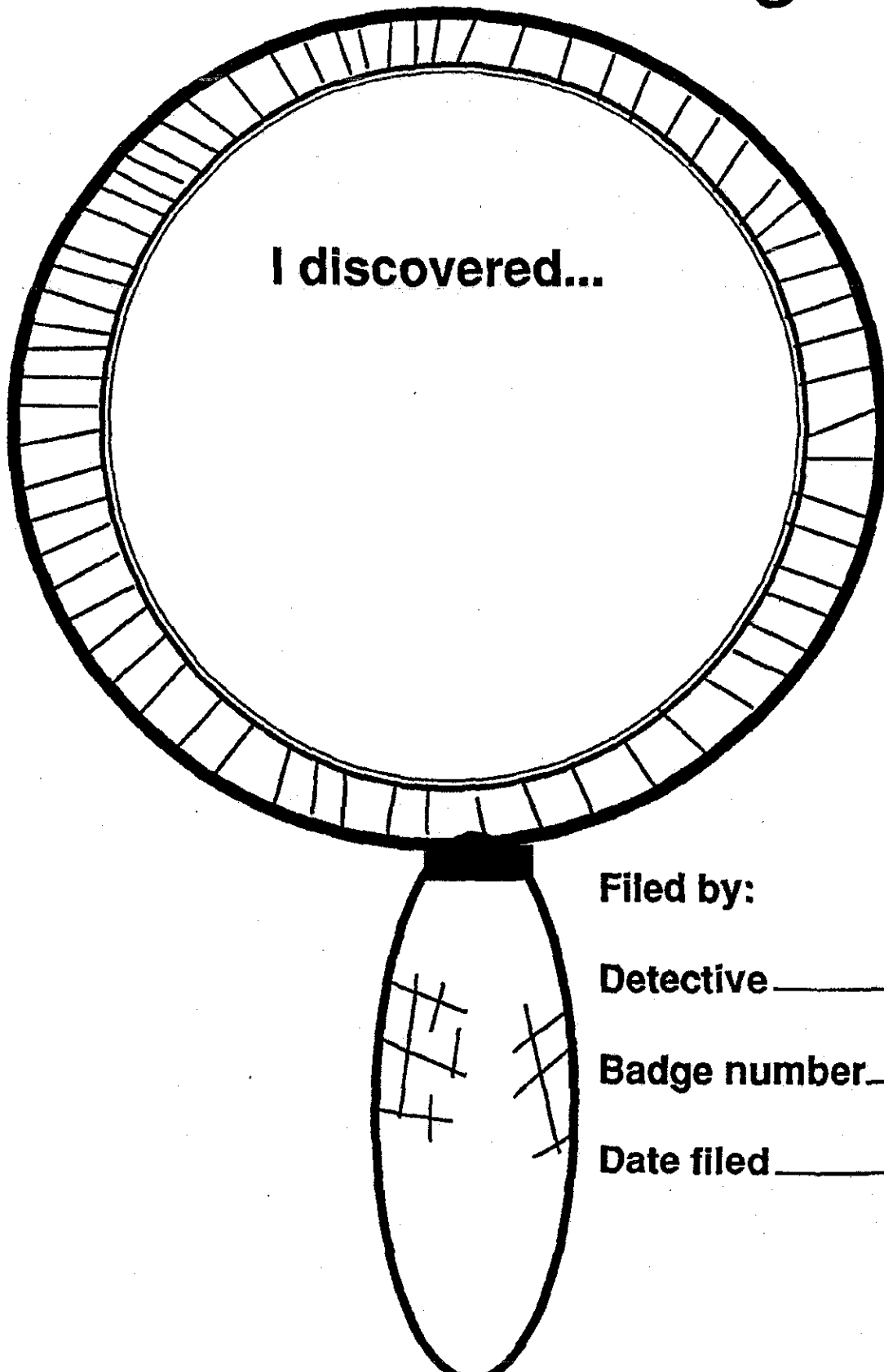
1. Spy glasses may be displayed on a bulletin board.
2. Letter may be written to businesses or individuals encouraging clean water-no pollution.
3. Pollution may be made by "agency" members to discourage water pollution.

Resources

Mississippi Department of Environmental Quality, Mississippi Soil and Water Conservation Commission, EPA.

Author: Nancy Granholm

Pollution Solution Agency



Filed by:

Detective _____

Badge number _____

Date filed _____

Front

Pollution Solution Agency



Water Watch Divison

F
O
L
D

Inside

Detective

F
O
L
D



PLAY BALL!

Subject: Math

Honors Class

Teaching Time: Two Class Period

Focus: Soil Texture, Determining the Circumference of a Sphere, Percentages

Project/Extended Activity # 38

Curriculum Objective: Consumer Science: Soil Chemistry

Learning Objective: Students will determine sizes of different soil particles. Students will determine surface areas of a beach ball, a baseball and a marble.

Teacher Tip

Students may need prior knowledge of decimals, fractions, and percentages. This activity may be used to introduce a unit in these areas.

Teacher Background

Soil is made up of four distinguishable elements—air, water, organic materials (living and dead plants and animals), and minerals (parent materials). The average soil's composition is 45 percent minerals, 25 percent water, 25 percent air, and five percent organic matter.

Soil has many characteristics and is classified accordingly. Color is the most obvious and is primarily dependent upon the type of parent material and organic matter content. A reddish color indicates parent material is having a high iron content while a dark grey or black color denotes basalt. A gray to off-white color soil is likely to have formed from rocks that had a high quartz content. Organic matter adds brown and black colors to the soil. A dark soil will absorb more sunlight than a light soil, thus the temperature will increase more rapidly. This is an important factor to consider in agriculture.

Another soil characteristic is its texture. Soil texture is classified by the size of the soil particles measured in millimeters (mm). Keep in mind that millimeter is about the diameter of the lead in a pencil.

Gravel Greater than 2.0 mm

Coarse Sand 2.0 - 0.2 mm

Fine sand 0.2 - 0.02 mm

Silt 0.05 - 0.002 mm

Clay Less than 0.002 mm (requires a microscope to see)

Soil texture determines the soil's ability to drain or hold water. It also determines the amount of expansion and contraction that occurs when it gets wet and dries out. People planning to build a pond want a soil with a high clay content because it holds water. People planning to build a house do not want a high clay content because it expands and contracts too much and will crack the foundation.

Materials

- * 1 plastic beach ball
- * 1 baseball
- * 1 marble
- * 1 cup each of sand, silt and clay
- * water

Sample Questions

1. Which has the largest soil particle? Sand, Silt or Clay?
2. Why are soil surveys important to builders?

Learning Procedure

1. Use the different balls to represent the different soil particles: sand—beach ball; silt—baseball; clay—marble.
2. Let students look at and feel the dry particles of sand, silt and clay to see the relationship of their sizes to the balls. (Note: a microscope will be needed to see the clay particles clearly.)
3. Have students determine the circumference of the balls. Relate these to the known circumferences of the soil particles. Formula: $22/7 \text{ times } r \times 2$
4. Let students get some of each soil type slightly moist and try to make a ribbon between their thumb and forefinger. (Sand—crumbles; silt—short ribbon; clay—long ribbon) Relate this to the water holding capacity of different soils.
5. Have students use a textural triangle to mix different percentages of each of the three particles to make up different soil types. Example: a soil of 20 percent clay, 40 percent silt, and 40 percent sand is a loam. Let students measure soils and determine the percentages of each, then use the textural triangle to determine the type of soil they have created. (Your local soil conservationist can tell you some of the common types of soils in your area.)

Supplemental Activities

1. For lower grade levels, measure circumference of marbles and balls.
2. View film, "Soil, We Can't Grow Without It," National Wildlife Federation. Available from your local Soil Conservation Service office.
3. Obtain soil survey book from your local Soil Conservation Service Office and investigate soil at your local school site or student's home-site.
4. Take students outside and dig in the soil. Look for sand, silt or clay.
5. Invite local district conservationist or soil scientist as a resource person to visit classroom and discuss soils.

Resources

USDA Soil Conservation Service

Author: Michael Newman

Textural Triangle

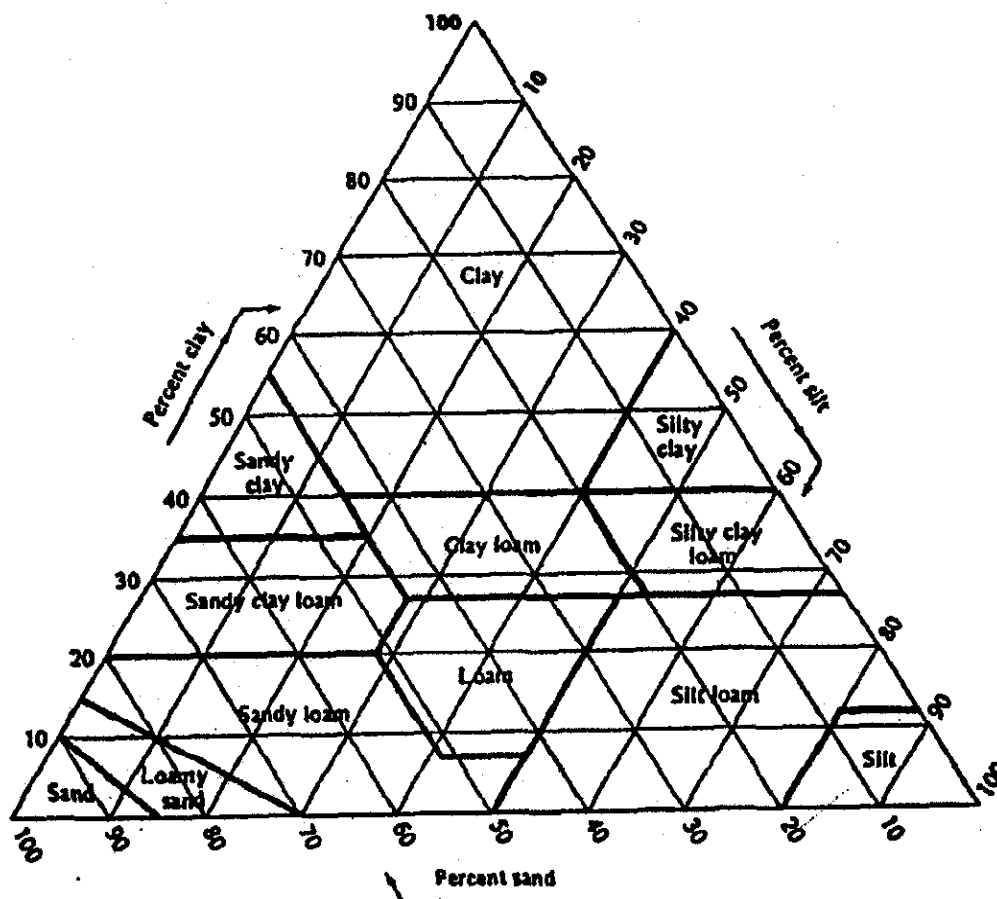


Chart showing the percentages of clay (below 0.002 mm.), silt (0.002 to 0.05 mm.), and sand (0.05 to 2.0 mm.) in the basic soil textural classes.

WHAT HAPPENS TO WASTE?

Subject: Science, Reading, Art
Teaching Time: Two weeks
Focus: Sanitary Landfill, Open Dump, Contaminate, Organic, Inorganic

Project/Extended Activity # 39

Curriculum Objective: Identify the positive and negative aspects of man's impact on the environment and its effect on living things.

Learning Objective: To compare what happens to waste in a dump and a sanitary landfill and why water is important in this process.

Teacher Background

Have students view video, "The Rotten Truth," by 3-2-1 Contact (available through your local Soil Conservation Service office).

Americans generate 158 million tons of solid waste annually or about three-and-a-half pounds each for every adult and child in the United States. Mississippi's own rate of waste production daily is 10,000,000 pounds. People Against Litter, 808 North President St., Jackson, MS 39201

Materials

- * Plastic gallon jugs
- * Trash (organic and inorganic)
- * Plastic wrap

Learning Procedure

1. Begin with a discussion to see where students think their garbage goes.
2. Discuss what things go into the average American garbage can.
3. Explain that there are two basic ways of getting rid of solid waste.
 - a. Dump (large hole in the ground where all kinds of solid wastes are thrown in. After a period of time it grows into large piles. This is a very unsanitary condition.)
 - b. Sanitary Landfill (an improvement over dumps because a cover of dirt compacts each layer of solid waste, thus reducing health hazards.)
4. After discussion and viewing video, "The Rotten Truth," students will make a mini-landfill.
5. Directions for mini-landfill:
 1. Fill a one-gallon milk jug with a layer of soil, a layer of garbage, a layer of soil and a layer of garbage and end with a layer of soil.
 2. Sprinkle with water and seal with plastic wrap and tape. (A worm can be optional)

3. Open every day for air and water.

4. Students should chart and record changes in mini-landfill.

6. For evaluation, students will present their charts to show observations.

Supplemental Activities

1. Discuss how sanitary landfills are safe to the environment. Open dumps attract rodents, disease, odors, etc. Run-off from landfills is not as hazardous because of soil cover.
2. Art Activity - Make bulletin boards showing what Garbage Gremlin does in the dump and what the landfill Leprechaun does in the landfill. The Garbage Gremlin is the symbol of people's wastefulness. His side of the board would show an open dump. The Landfill Leprechaun could show a rainbow with the trash covered with soil and being a much more environmentally pleasant side.
3. Make tin can stilts to show how to recycle tin cans.
4. For extended learning, explain to students that neither a dump or a landfill is desirable because of leachate. Leachate is produced when rainwater (directly or through run-off) soaks into a landfill. Rainwater moves through landfills under gravity's influences. As it soaks through it can mix with toxic wastes that have been deposited in the landfill. Some large cities have systems to collect leachate to prevent it from getting into groundwater. Some states now require plastic liners in the bottom of landfills and have groundwater monitoring systems.

Resources

Mississippi Department of Environmental Quality, "Let's Reduce and Recycle," Curriculum for Solid Waste Awareness, Earth Book for Kids - Linda Schwartz, "The Rotten Truth," 3-2-1 Contact (video).

Author: Pam Whitten

LET'S EAT OUT!!!

Subject: Science, Language Arts, Math
Teaching Time: One or Two Class Periods
Focus: Heron, Ducks, Muskrat, Water Plants, Mayfly, Water Turtle, Underwater Plants, Bullfrog, Bluegill, Bass, Minnow, Channel Catfish, Crayfish, Dead Animals, Dead Plants, Worm, Bacteria, Dragonfly Adult, Dragonfly Nymph, Tadpole, Water Plants, Beaver, Water Snake, Sowbug, Underwater Plants, Microscopic Animals, Small Young Tree, Sun, Water.

Project/Extended Activity # 40

Curriculum Objective: Match an animal with its habitat and relate the habitat to the animal's need for food, shelter and space. Identify the positive and negative aspects of man's impact on the environment and its effect on living things. Identify the interdependence of organisms in food chains, food webs and energy pyramids. Consumer Science: Environmental Problems.

Learning Objective: The student will identify the many relationships that exist and depend on each other in a balanced aquatic food web by matching one with another. Students will also identify what happens when forms of pollution are introduced to the food web.

Teacher Tip

This can be used as introduction to any aquatic unit. It shows the many relationships that exist in an aquatic environment such as a pond or stream. You can also use the same concept using different animals for other environments such as a forest, etc.

Teacher Background:

All of life is powered by energy from the sun. Photosynthesis occurs when green plants capture the sun's energy in sunlight and make food and oxygen. Animals use the food and oxygen that plants produce and release carbon dioxide for use by plants. In an environment, green plants are called producers and animals are called consumers. In a pond, feeding relationships are important. Pond food chains begin with small microscopic plants. These are eaten by microscopic animals; some insects eat these animals. In turn, a bluegill will eat these insects and a bass will eat a bluegill. People eat bass. This is a food chain. Food webs are interconnected by these food chains. A pond food web shows what eats what. If everything is in balance, there will be a variety of something for everything to live and produce. If something is removed in this link, the food web is interrupted and the ecological balance is upset. Everything depends on something else for survival. Each living thing is important. If pollution, such as sediment, pesticides or other dangerous substances are introduced in this environment, everything will be affected and could die.

Materials

- * 3x5 note cards
- * Skein of knitting yarn

Sample Questions

1. Name three animals that live in a pond habitat.
2. What is a consumer? What is a producer?
3. What does a bullfrog eat?

Learning Procedure

1. Introduce the lesson by pre-teaching background material from Teacher Background. Pre-teach the following terms:

habitat, producer, consumer, food web, photosynthesis

2. On 3x5 note cards, write the name of each producer and consumer from focus section. Punch a hole in both sides of the top of each card. Pass out the cards and have students thread a piece of yarn through each card and tie it long enough to go around student's neck and hang down in front of chest. (Approximately 40")
3. Arrange students in a large circle. Each student hangs card around his/her neck.
4. Explain to students that they have formed a web of life that exists in a pond habitat. Ask them what they might see in a pond environment (plants and animals). Have each student tell what they are. They can say their name in front of it if desired. (example: Tommy Bullfrog)
5. Begin with the sun, wrap a piece of the end of roll of yarn around student's finger. Ask the question, what depends on the sun for survival? Someone should answer plants. Pass the roll of yarn over to the student representing water plants and gently wrap one or two loops of the yarn around that student's finger.
6. This activity continues until everything is used up in the web.
7. At that point, introduce water pollution. Ask students what would be affected if the bass died due to pesticides from runoff water from a nearby cotton field.
8. Take the yarn off of the student's finger that represents the bass. Have students notice how other aquatic life in the food web is affected. Some animals die, such as the heron (that eats bass), or the bluegill might overpopulate due to lack of bass.
9. Have students give other examples of Nonpoint Source Pollution that might affect the pond.
10. For evaluation, have students name two things that they depended on in the food web for survival.

Supplemental Activities

1. Design a food web sheet with pictures or words of aquatic life listed above. Have students draw arrows to what eats what.

Resources

"Save Our Streams" Isaac Walton League of America, 1401 Wilson Blvd., Level B, Arlington, VA 22209, Aquatic Wild, "Fishing for Answers," Missouri Department of Conservation Education Section, Department of Conservation, P.O. Box 180, Jefferson City, MO 65102-0180.

Glossary

Aerobic - able to live or grow only where free oxygen is present.

Agriculture - the production of crops, poultry and livestock; can include forestry and gardening. It is the science of farming; work of cultivating the soil.

Air - the invisible mixture of gases (nitrogen, oxygen, hydrogen, carbon dioxide, argon, neon, helium, etc.) that surrounds the earth; atmosphere.

Anaerobic - microorganisms that can live and grow where there is no air or free oxygen; anaerobes get oxygen by the decomposition of compounds containing it.

Aquatic - something that lives or grows in the water.

Aquifer - a supply of usable ground water stored in the spaces, cracks and pores of underground rock, sand, soil and gravel.

Artesian Well - a well drilled deep until it reaches water, which is then forced up by underground pressure.

Berm - a ledge or shoulder.

Bog - a wet, low area, filling or filled with partially decayed matter at peat. Wet, spongy ground, small marsh or swamp.

Buffer - something that lessens or absorbs the shock of impact.

Carbon Dioxide - CO₂, a colorless odorless incombustible gas that passes out of the lungs in respiration, heavier than air. In photosynthesis, carbon dioxide and water are absorbed by plants, which synthesize certain carbohydrates and release oxygen into the air.

Chemicals - all matter on Earth is composed of chemicals.

Cloud Formation - the arrangement of clouds; visible bodies of very fine droplets, a visible mass suspended in the air.

Conservation - the wise use, management and protection of natural resources (air, soil, water, trees, wildlife, minerals.)

Contaminate - to damage the quality of air, soil or water by sewage, industrial waste, or other matter.

Construction - the act of putting something together such as building a house or shopping center. In relating to nonpoint source pollution, it is considered a land use activity that can contribute to pollution problems. Sometimes construction increases sediment problems in streams.

Drip - to fall in drops.

Earth - the land surface of the world, as distinguished from the oceans and air.

Ecology - the science of the relationships between organisms and their environment.

Ecosystem - the interacting system of biological community and its nonliving environment.

Effluent - the outflows, usually offensive, from sewage or industrial plants or septic tanks.

Environment - all of the conditions, circumstances, and influences that affect the development of existence of organisms. The total of all of the surroundings air, water, vegetation, human element, wildlife that has influence on us.

Erosion - the removal or wearing away of soil or rock by water, wind or other forces or processes.

Evaporation - changing from a liquid to a gas; for example when water turns into steam or water vapor.

Feedlot - an enclosed area in which animals such as hogs or cattle are fed before being sold for meat.

Fertilizer - a chemical or natural material that supplies nutrients to aid in the growth of plants.

Fill line - the pipe in a septic tank system that drains liquid from the tank location to a drainfield in the soil.

Flow - the direction of movement of a stream or river.

Forest - a complex system of plants and animals in which trees are the most conspicuous component.

Ground Cover - low growing plants that form a dense, extensive growth on the ground.

Groundwater - water found under the ground, in the zones of bedrock and soil.

Habitat - the arrangement of food, water, shelter, space and arrangement suitable to an animal's needs. It is an area of land in which plants and animals live, grow and reproduce.

Herbicide - a chemical or substance that kills weeds.

Hydrologic cycle - the movement of water in nature that never ends.

Hydrologic modification - alters the path of runoff water resulting in increased erosion.

Infiltration - soaking into or through.

Insecticide - a chemical or substance that kills insects.

Lagoon - a shallow lake or pond.

Lake - an inland body of water, usually freshwater.

Land - one of the major factors of production that is supplied by nature and includes all natural resources in their original state such as mineral deposits, wildlife, timber, fish, water and the fertility of the soil.

Landfill - a location where solid waste (garbage) is disposed of. In relating to nonpoint source pollution, a landfill is a land use activity that can contribute to pollution to the environment by pollution seeping into groundwater and surface water.

Land Disposal - (septic tank disposal systems) - bacteria and nutrients.

Leach - when material in the soil (such as nutrients, pesticides, chemicals) are washed into lower layers of soil or are dissolved and carried away by water.

Marsh - a tract of wet, low, soft land.

Mulching - to add different materials to the soil to protect it from erosion, cold, to reduce evaporation, to control weeds and to enrich the soil. Such materials could be leaves, pine straw, or bark.

Nitrate - a form of nitric acid used in fertilizers.

Nitrite - a salt of nitrous acid, used in fertilizers.

Nonpoint Source Pollution - a type of pollution whose source is not readily identifiable—such as pollution caused by a car exhaust carried off city streets by rainwater.

Nutrients - substances which are necessary for growth of all living things (i.e. phosphorus, nitrogen and carbon).

Paper - a thin flexible material in sheets made from rags, wood pulp or other fibrous material and used to write or print on, etc.

Percolation - to pass through small spaces or a porous substance.

Permeability - open to passage or penetration, especially by fluids.

Pesticides - a chemical or substance that kills insects or weeds.

Photosynthesis - the process by which green plants convert carbon dioxide and water into simple sugar. Chlorophyll and sunlight are essential to the series of complex chemical reactions that are involved.

Pollution - contamination of air, water or soil by the discharge of wastes or other harmful substances.

Pollutant - something that contaminates, makes land, water and air dirty and unhealthful.

Point Source Pollution - a type of pollution that can be tracked down to a specific source such as a factory discharge pipe.

Pond - a natural or man-made depression, smaller than a lake filled with water.

Precipitation - to condense (vapor, etc.) and cause to fall as rain, snow, sleet, etc.

Runoff - water that flows off land into streams and other waterways.

Rural -country life, having to do with farming.

Sand - soil particles that are from 0.02 mm to 2.0 mm in size.

Sanitary landfill - a landfill where the garbage or other refuse is covered with soil, controlling smell, rodent activity, etc. and speeding up the process of decay.

Scum - waste that float on top of a septic tank such as grease and fat.

Sediment - soil, sand, and materials washed from land into waterways.

Septage - the sludge and scum in a septic tank.

Septic tank - a tank that holds sewage which is broken down by bacteria.

Sewage - waste matter carried off by sewers or septic tanks.

Silt - smaller particles of rock that you cannot see without a microscope (.002 mm to .05 mm). It feels smooth and velvety.

Silviculture - the science of cultivating forest crops.

Sludge - Mud, mire or ooze covering the ground.

Soil Erosion - the wearing away of the land surface by wind or water. Erosion occurs naturally from weather or runoff, but is often intensified by man's land-clearing practices.

Stream - a small river.

Surface Mining - extracting dirt, gravel or minerals from the surface of the ground.

Surface water - water that lies above the ground; for example oceans, rivers and lakes.

Swamp - a wetland where the soil is saturated with water often with trees as the dominant cover vegetation.

Texture - referring to soil, the relative amounts of sand, silt and clay in a given soil sample.

Topsoil - the upper layer of soil, usually very rich and darker than the subsoil.

Toxic - harmful, destructive or deadly, poisonous.

Underground Storage Tanks - tanks that contain gasoline, oil and other chemicals. This can contribute to nonpoint source pollution if the tank leaks.

Urban storm Runoff - water runoff from a heavy rain from urban areas. This runoff can contain grass clippings, waste, trash and other substances.

Vapor - the gaseous form of water.

Waste - garbage, trash

Watershed - all the land that serves as a drainage for a specific stream or river.

Water Table - the top surface of the saturated zone of the soil. The upper level of groundwater.

Waterway - a natural or man-made place for water to run through (such as river, stream, creek, or channel).

Wetland - an area of land that is regularly wet or flooded, such as a marsh or swamp.

Wildlife - animals that are not tamed or domesticated. Wildlife may include insects, spiders, birds, reptiles, fish, amphibians and mammals.

Resources

American Forest Council, 1250 Connecticut Ave., NW Suite 320, Washington D.C. 20036

Cranberry Halloween, Devlin and Wende, Aladdin Books, 1990.

"Down the Drain," 1991. Children's Television Workshop, video (30 Minutes) Call EPA at 513-569-7771 for ordering information. Available through your local Soil Conservation Service office.

Earth Book for Kids, Activities to Help Heal the Environment, Schwartz, Linda, The Learning Works, Inc., P.O. Box 6187 Santa Barbara, California 93160, 1990.

Environmental Action Coalition, 625 Broadway, New York, NY 10012 (212) 677-1601. "Green Spaces in City Places," (forestry in urban environment); "City Trees, Country Trees," (forestry); "Don't Waste Water," (waste disposal); "Woods and Water," (water supply and conservation).

Farm Bureau, "Ag In the Classroom"

Going Green, A Kid's Handbook to Saving the Planet, by Elkington, John; Halles, Julia; Hill, Douglas; and Makower, Joel. Puffin Books, 1990

Lester and Clyde, Reece, James. Scholastic

Liza Lou and the Yeller Belly Swamp, Mercer, Four Winds Press, 1980.

Mississippi Cooperative Extension Service, Mississippi State University, Mississippi State, MS 39762. "Water Riches," teaching packet on water quality.

Mississippi Department of Environmental Quality, Office of Pollution Control, Water Quality Branch, P. O. Box 10385, Jackson, MS 39289-0385. (601) 961-5171. Brochures and Pamphlets on "Nonpoint Source Pollution, Problems and Solutions."

Mississippi Department of Wildlife, Fisheries and Parks, 2906 N. State St., Jackson, MS 39216

Mississippi Farm Bureau Federation 6310 I Box 1972, Jackson, MS 39205 Mississippi Coordinator of Ag In the Classroom.

Mississippi Forestry Commission, 301 N. Lamar, Suite 300 Jackson, MS 39201 (601) 359-1386. Mississippi Coordinator of - Project Learning Tree.

Mississippi Museum of Natural Science, 111 N. Jefferson, Jackson, MS 39201. (601) 354-7303. Mississippi Coordinator of - Project Wild and Aquatic Wild.

Mississippi Soil And Water Conservation Commission, P. O. Box 23005, Jackson, MS 39225-3005. (601) 359-1281.

Mississippi Wildlife Federation, 520 N. President St., Jackson, MS Sponsor - "Adopt a Stream."

National Association of Conservation Districts, P. O. Box 855, League City, TX 77574-0855. "Water and Me."

National Forest in Mississippi, 100 West Capitol St., Ste. 1141, Jackson, MS 39269.

National Wildlife Federation, 1400 16th St. NW, Washington, DC 20036-2266. (800) 432-6564.

People Against Litter, 808 North President St., Jackson, MS 39201.

"Save Our Stream," The Izaak Walton League of America, Inc., 1401 Wilson Blvd. Level B, Arlington, Virginia 22209.

175 Science Experiments to Amuse and Amaze Your Friends, Walpole, Brenda. Random House, New York.

50 Simple Things Kids Can Do To Save The Earth, The Earthworks Group, 1990.

The Lorax, Geisel, Theodore (Dr. Suess), Random House, 1971

"The Rotten Truth," Children's Television Workshop, video (30 Minutes). Available through your local Soil Conservation Service office.

"The Water Cycle", Educational Images, Ltd., P. O. Box 3456, West Side, Elmira, NY 14905, 1-800-527-4264. A comprehensive overview of the hydrologic cycle. Slide show. Cost: \$37.95.

U. S. Department of the Interior/U.S. Geological Survey "Distribution of the World's Estimated Water Supply."

U. S. Department of the Interior/U.S. Geological Survey, "Ground Water and the Rural Homeowner," Books and Open-File Reports Section U.S. Geological Survey, Federal Center, Box 25425, Denver, CO 80225.

U.S.D.A. Soil Conservation Service, Suite 1321, Federal Bldg., 100 West Capitol St., Jackson, MS 39269. Publications available:

- * Conservation and the Water Cycle, No. 326

- * Fact Sheets on water quality

- "Management for Farmers"

- "The Farmers Guide for Controlling Erosion"

- "Improving Water Quality by Managing Animal Waste"

- "A Farmers Guide to Pesticide Management"

- "Choosing and Using Pesticides"

- "Managing Animal Waste"

- "Protecting Water Quality at Home and on the Farm"

- "Keeping Sediment Under Control"

- "Managing Nutrients"

- "Glossary of Water Quality Terms"

- "USDA 1991 Water Quality Projects"

- "Land Use Planners: Soil Surveys Can Help You"

- "Developers and Builders: Soil Survey Can Help"

- "Soil Erosion - By Water"

- "Developing Backyard Wildlife Habitats in Mississippi," DeFazio, John T., 1990.

U. S. Environmental Protection Agency, Region IV 345 Courtland St. NE, Atlanta, GA 30365 (404) 347-2126.

Brochures

- * Polluted - No Fishing, 1990

- * Citizen's Guide to Pesticides, 1990

- * Is Your Drinking Water Safe?, 1990

- * America's Clean Water Act, 1990

- * Developing Criteria To Protect Our Nation's Waters, 1990.

- "Earth Notes," Grades K-6, EPA 22K - 1001, Fall, 1991.

EPA Journal, Volume 17, No. 5, Nov./Dec. 1991

EPA "America's Wetlands, Our Vital Link Between Land and Water," Feb. 1988. OPA-87-016. Office of Wetlands Protection, Office of Water, Washington, DC 20460.

U.S. Environmental Protection Agency, Office of Research and Development, Cincinnati OH, AWBERC-91-09, "Always a River," Supplemental Environmental Education Curriculum on the Ohio River and Water, grades K-12.

"Water: A First Film." Phoenix Films, Inc., 468 Park Avenue South, New York, NY 10016, 1-800-221-1274. Describes the importance of water to plants, animals, and the Earth (12 minutes). Primary and intermediate grade levels. Video or 16 mm film.

Water Quality Indicators Guide: Surface Waters, U.S. Dept of Agriculture, Soil Conservation Service SCS-TP-161 (1988).

"Water In Your Hands", Soil & Water Conservation Society, 1990. SWCS 7515 N.E. Ankeny Rd., Ankeny, Iowa 50021-9764 or call 1-800-THE-SOIL.